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I.—*Johóle and its former Dependencies of Jompóle Gominchi. By Lieut. NEWBOLD, A. D. C. to Brigr. General WILSON, C. B.*

Johóle. Of *Johóle*, the third of the four *Menangkábowe* states, still less is known than of *Rumbówe* and *Sungie Ujong*.

An Englishman of the name of GRAY, (whose information is to be taken, however, with caution,) is said to have been the only European who has penetrated into the interior of this state. He passed through part of it in 1827, on his return to *Malacca* from *Pahang*, whither he had performed a journey overland, across the peninsula, to barter opium for the gold dust of the latter place.

His route lay through *Naning*, part of *Rumbówe*, *Srímenánti*, *Jampóle*, *Ulu Seruting*, *Ulu Braugh*, and *Ulu Pahang*. The journey was performed in 14 days.

From *Tabu*, in *Naning*, to *Jompóle*, he was four days passing over mount *Lanjut*, to the villages of *Gadang* and *Tanjong*; over mounts *Míko*, *Pabí*, and *Púnting Páhat*, through the villages of *Passir*, *Júno*, and *Píla*, in *Srímenánti*; and from *Píla* to *Jompóle*, “one day’s walk.”

Mr. GRAY describes the country he passed through, to have been in a state of high cultivation, particularly at *Míko*, and in the vales of *Púnting Páhat*, *Júno*, and *Passir*.

He observes that the *paddy* at *Míko* is preferable to that of *Malacca*, and that it is supposed by the people that the ground there is better for cultivation, one *gantang* of seed never producing less than a hundred-fold.

The produce of mount *Míko* is sapan wood, dammer, and canes of the species termed *Pinang-lawyers* in abundance. *Jompóle*, he con-

jectures, to be about 90 miles distant from Malacca. *Pahang* is estimated at 300 miles distance from *Jompóle*. From *Jompóle* to *Pahang* the journey is by boat down the river *Seruting* to the large lake of *Braugh*, called *Tassek Braugh*; which is said by Mr. GRAY to be nearly fifty miles in circumference, and is formed by the flow of water from the neighbouring mountains.

If this account be correct, the lake *Braugh* exceeds in dimensions the recently discovered inland lakes in Sumatra.

The natives, however, have described this lake to me to be of much less extent; narrow but long. Its communication with the *Pahang* river, which empties into the China sea, is by a river called the *Braugh*.

Regarding the navigation of these rivers, Mr. GRAY observes: "In some parts of the *Seruting* and *Braugh*, a brig might go up, and in other parts, nothing but a small boat; on account of the water being above the fallen trees, so that the boat must be lifted before it can proceed, on account of the overflowing banks of the river."

The *Pahang* river, from the place where it receives the waters of the *Braugh*, down to the town of *Pahang*, is wide and deep. These streams are deepest in the months of November, December, and January. From the month of March to that of August, Mr. GRAY was informed, that it is impossible to proceed from the *Seruting* river to *Pahang*, on account of the paucity of water. The general depth of these rivers, in January, he ascertained to be between 40 and 60 feet; but on his return in February, he found their depth diminished by one-half.

There are a few villages on the banks of these rivers, but for the most part they are covered with lofty forests, tenanted by the rhinoceros, tapir, tiger, elephant, and scarcely more civilized *Jacoon*.

Mr. GRAY met with great kindness and hospitality from the inhabitants of the different estates through which he passed. He fell, however, a sacrifice to his exertions, dying of jungle fever, contracted during the journey, twenty-five days after his return to Malacca.

Boundaries.—*Johóle* is bounded on the north by *Ulu Pahang* and part of *Rumbówe*: to the south by part of *Naning* and *Múar* or *Segámet*: to the east by *Segámet*, and to the west by *Srimendúti* and part of *Rumbówe*. The boundaries with Malacca are from *Búkit Puttús* to *Battang* Malacca, and from *Battang* Malacca by *Bánkóng** *Chóndóng* to Mount *Ophir*.

* *Bánkóng Chóndóng* is a large tree, growing in the forest that separates *Assahan* from Mount *Ophir*. The tree was still in existence when I visited Mount *Ophir* in 1833.

With *Segúmet* and *Múar*, its boundaries are *Murbówe sa rátús* (the hundred *Marbówe* trees) and *Bánkóng Chóndóng*; with *Rumbówe*, *Búkit Pabí*; and with *Srímenánti*, *Búkit Píla*.

Population, &c.—The population of *Johóle* is estimated at 2,080 inhabitants. The principal villages are *Nuri*, *London*, *Tney*, *Táman*, and *Bennong*.

Johóle is governed by a *Panghúlú* and *Ampat Sákú*. The former, like his brother chief of *Sungie Ujóng*, is elected by the *Sákús*, and by the *Bátin dú ablas*, or twelve heads of the *Jacoons*.

The name of the present *Panghúlú* is *ABU BEKR*, or *BANCHITA*, and his title *Johan Lélah Percásseh*; he resides at *Nuri*, is an intelligent looking person; plain, simple, and collected in manner, and much respected by his people.

The tribes are those of *Bodoánda*, *Sa Melóngan*, *Tiga*, *Battu*, and *Múkal*.

Srímenánti and *Jompóle*, were formerly considered dependencies of *Johóle*, but now assert their independence, as also does *Gominchi*. The *Panghúlú*, *LESSYE*, of the latter place died lately, and his brother *MAHAMMED KARI* succeeded him. *Póndok Passir*, a small state under the influence of *Srímenánti*, was also a dependency of *Johóle*, and is ruled by a petty *Panghúlú* of its own.

Besides the usual rights of revenue, the *Panghúlú* of *Johóle* levies ten per cent. on the produce of the tin mines, together with a tax on the gold of *Gominchi*, which will be shortly alluded to.

Trade.—The trade of *Johóle* consists chiefly in gold dust; 20 catties of which are said to be produced annually. Tin, about 300 piculs. Fruits, ratans, jaggery, and fowls are brought in considerable quantities down to Malacca.

Jompóle.—*Jompóle* was anciently a dependancy of *Johóle*, but is now nominally governed by *Rája ALLANG*, a son of the third *Menangkábówe* prince, *Rája HAM*. The *Panghúlú* and *Ampat Saku* exercise almost independent sway.

The name of the present *Panghúlú* is *HASSAIN*; the tribes are those of *Bódoanda*, *Sa Melóngan*, *Anók Malacca*, and *Tiga Báttu*.

Jompóle is in the high road of the *Pahang* traders travelling across the peninsula to Malacca; it is situated on a small river of the same name, which flows into the *Múar* river, [one of the largest streams on the western coast of the peninsula,] by which it has communication with the Straits of Malacca. By the rivers *Seruting* and *Braugh*, an easy intercourse from November or October to February is kept up with *Pahang* and the eastern coast. The *Rája* here levies a duty on the opium, tobacco, cloths, iron utensils, salt, &c. passing through

Jompóle to *Pahang*, as well as on the gold dust and silk cloths of *Pahang* returning to Malacca.

Jompóle produces a considerable quantity of tin, sapan wood, rice, dammer, ratans, and a little gold, which is sent down the *Múar* river to Malacca (eight days pull), and also to *Pahang*.

The population of *Jompóle* is estimated at 2,000; it is divided into three *Múkims*; viz. those of *Limbájon*, *Turúntong*, and *Qualla Lenney*.

Gold.—The following account of the gold mines at *Chimendros*, with the exception of the part relative to the assaying of the metal, which is from personal observation, is almost entirely drawn from native information.

Búkit Chimendros is a hill situated in *Gominchi*, a territory subject to the *Panghúlú* of *Johóle*, and bordering on the eastern frontier of *Naning*. It is covered and surrounded by an uninhabited forest of great extent, intersected by numerous rivulets, which derive their source from the hill.

Veins of quartzose rock run over it at various depths (generally from 12 to 20 feet) below the surface, forming the matrix in which* the gold is found in small broken streaks.

The rock is enclosed in a bed of a sort of white clay, indurated more or less, termed *Nápal*.

The method pursued by Chinese and Malays for separating the metal from its matrix resembles that adopted by the Hungarian miners, with this exception, that the process of amalgamation is not practised by the former for this purpose. The Kling assayers of gold, however, avail themselves of it in their vocation, as will presently appear.

The Malay miners, as soon as the precise spot and minute have been determined by their diviners, *Páwangs*, or other charlatans supposed to be skilled in discovering the hidden treasures of the earth, commence clearing the ground of trees, brushwood, &c. and then proceed to remove the roots and vegetable soil by means of *Biliongs* and *Chonkoles*, (the Malayan adze and spade,) until the bed of *Nápal* is laid bare. These implements are now put aside, and a heavy sort of iron crow-bar, (*Perjong*) is had recourse to.

The first layer of *Nápal* is soft and whitish; the second has a red-dish tint. The last is a black incrustation resembling brick in hardness, and hence called by the natives *Tambíker Quáli*; this is commonly two fingers' breadth, in thickness, and being removed, discovers the

* A specimen of this rock, in which a small portion of gold is imbedded, or rather disseminated, has been forwarded to the Society.

white vein of rock, the matrix of the gold, and termed the *Beting*. It is generally between three and four feet in diameter: underneath lies a bed of whitish earth, below which gold is never found.

The next process is that of breaking up the *Beting*, for which purpose the *Perjong* is employed. From the extreme hardness of the rock this is a very laborious and tedious task. The coarse pieces are then pounded in a sort of large mortar cut from the quartz rock. The pulverized stone is then passed through sieves (*Kisye*) of ratan, and carried in small baskets to a running stream, where the smaller stony particles are washed away, while the gold dust, with the grosser pieces, sink to the bottom of the conical vessel in which it is subjected to the action of the stream.

The refuse is picked out, and the gold dust again carefully washed and collected in a cocoanut shell or leaf of the *Pallas* tree, and conveyed to the *Bongsal*, where it is dried by means of a red hot piece of charcoal being repeatedly passed over its surface. After the adherent finer particles of the sand have been removed, it is weighed into quantities, generally of one *tael* each, which are carefully folded up in small pieces of cloth.

These packets constitute the *Bunkals* of commerce.

In Sumatra, according to MARSDEN, the parcels or *Bulses*, in which the gold is packed up, are formed of the integument that covers the heart of the buffalo.

The *Bunkals* are, as in Sumatra, frequently used as currency instead of coin.

The weights* for gold formerly used as *Chimendros* and *Taon* (a place about half a day's journey thence) are as follow :

2	small sâgas (<i>Sâga kechil</i>)	=	1 large sâga (<i>sâga besâr</i>).
8	<i>Sâga besâr</i> ,	=	1 <i>Maïam</i> .
16	<i>Maïams</i> ,	=	1 <i>Tael</i> or <i>Bunkal</i> .
20	<i>Taels</i> ,	=	1 <i>Cattie</i> .

The *Sâga* is a sort of small scarlet pea with a black spot, the *Abrus Maculatus*.

Besides *Chimendros* and *Taon*, I have not heard of any place on the peninsula where gold is obtained from the solid rock. On Sumatra it is frequently found in this state.

The gold dust at *Pahang* and *Jellye* is procured in the same manner as that in the mines at the foot of Mount *Ophir*, already described in a paper published in this Journal; (*vol. ii. page 497.*)

The mines at *Reccan* are estimated to produce annually about 20 cattles of gold dust.

* At Malacca 10 *Sâga besâr* or 4 *Kûpongs* are equal to one *maïam*.

The *Panghúlú* of *Gominchi* first levied a tenth on the produce of these mines, but in consequence of large quantities of gold dust being secretly carried off, before the tenth had been levied, he substituted a sort of poll tax, amounting to a *maiam* of gold per annum, from each person working at the mines.

The *Panghúlú* of *Johóle* is in the habit of sending five or six buffaloes a year to the mines, receiving for every head of cattle two taels of gold.

These heavy drawbacks have caused the mines to become unprofitable to the speculators, and almost deserted. The former of these imposts, I believe, could readily be endured; but the latter *ad libitum* sort of exaction destroys all hope of reasonable profit.

The following is an estimate of the various degrees of purity of gold dust, produce of the peninsula. It will be necessary to premise, that *mútú*, is a term denoting the degrees of fineness for gold, of which there are 10, as fixed by the native assayers. Gold of 10 *mútú* is equal therefore to gold of 24 carats: gold not reaching eight *mútú* is called *mas mûda*, or young gold; and gold from eight to 10 *mútú*, *mas túah*, or old gold.

Gold of <i>Reccan</i>,	.....	9½ <i>mútú</i>
Mount <i>Ophir</i>,	.....	9¼ "
<i>Chimendros</i> and	}	9½ "
<i>Taon</i> ,		
<i>Pahang</i> ,	}	9¼ "
<i>Jellye</i> ,		
<i>Tringánu</i> ,		
<i>Calantan</i> ,		

From *Calantan* gold of 10 *mútú* is sometimes obtained.

The assayers of gold are generally *Chuliahs* or *Klings*, who acquire by constant practice the power of determining to the fraction of a *mútú* the purity of any specimen of gold dust brought from the eastward*. As they would be perhaps liable to imposition were this the only trial they subjected the metal to, they have recourse to the *Battu ují* or touchstone. This is a roughish black stone, apparently basalt, brought from continental India, and generally set in a small frame of bronze or brass.

The assaying needles are generally from 20 to 24 in number, ranged on a string, and alloyed in known proportions of copper and silver, marked on the surface, from three to 9¾ *mútú*. The needle and gold to be assayed are rubbed on the touchstone in parallel streaks, in the usual manner; a lump of the adhesive wax called *Lílin kalúlút* is then applied to the surface of the touch-stone, which brings off the two thin lamina of gold.

* The natives are, I believe, totally ignorant of the assay by cupellation and acids.

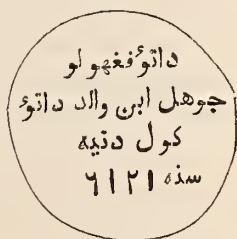
The difference between the two being more visible on the wax (which is coloured black for this purpose with a fine charcoal made from the plantain leaf) than on the stone. This is the reason the native assayers give for the removal of the streaks of gold from the stone to the wax, though to me no difference was perceptible: possibly the following may afford another clue to the practice of the natives in this particular.

In this wax the impressions of the gold, which would be lost on the stone, go on accumulating; a ball of it, which my native informant had used for the last 30 years, he supposed to contain above two *taels* of gold.

The metal is separated from the wax by means of heat applied gradually, in such proportions as barely to cause the wax to pass off in the form of smoke: the residuum is then subjected to the process of amalgamation. Half of the gold thus obtained is dedicated in alms to the poor, or on religious offerings, at the shrine of some favorite Saint or *Wali*; generally to that of MIRAN Sahib at Nagore.

The calculation of a Malay, long employed in the mines at *Chimendros*, makes the average quantity of gold produced from 40 lbs. of the pulverized stone, 24 grains of pure metal. Lumps of virgin gold, weighing from five to six *taels*, have been found in the alluvial soil here and at *Taon*. In *Jellye*, a mass weighing upwards of a *cattie* has been discovered: this will appear trifling if placed in comparison with that which REAUMUR mentions as having been shewn to the Royal Academy at Paris, weighing 448 oz. HELMS affirms that when one of the highest mountains of *Paraguay* fell down, about 50 years ago, there were discovered in it pieces of gold weighing from two to fifty pounds each.

Seal of Johóle, dated A. H. 1216.



[The date on the seal is reversed, a mistake that we have not unfrequently observed on Indian coins with Persian inscriptions. As this is the last Essay on the Malacca States with which Lieut. NEWBOLD will be able to favor us, it may be as well to point out where the preceding are to be found:

Visit to Mount Ophir,	vol. II. p. 497.
Account of Naning,	„ III. „ 601; IV. 297.
Ditto the four Menangkábowe States, ..	„ IV. „ 241.
Ditto Sungie Ujong,	„ IV. „ 537.—ED.]

II.—*Interpretation of the Tibetan Inscription on a Bhotian Banner, taken in Assam, and presented to the Asiatic Society by Captain BOGLE. By M. ALEXANDER CSOMA KÖRÖSI. [See Pl. VI. fig. 3.]*

[In a letter to the Secretary of the Asiatic Society; see also Proceedings of the Asiatic Society, 4th May, 1836.]

According to the request conveyed in your letter of the 30th April, I have translated the piece of magical superstition which you have faithfully transcribed from the Bhotian board. With exception of the salutation at the beginning and the conclusion, and a few terms in the middle, the whole is in the Tibetan language. The purport of it, as will be evident from the tenor of the translation, is, to obtain the favour and protection of several inferior divinities, to increase the prosperity, &c. of the person and family for whom the ceremony was performed, and this magical piece was erected or set up.

It may be that the flag-staff, with the wooden board containing this inscription, was carried before the Tibetan chief in his march, and so used as an ensign in war; but it is more probable that it belonged originally to the house top or terrace of the prince in Bhotan: for the houses of great personages in that country are generally decorated with such ensigns of victory at the four corners of the terraced roof. They are called in Tibetan རྒྱལ་མཚན་ *rgyal mtshan* (ensign of victory), and always contain inscriptions of similar purport with this.

In regard to the orthography of the piece, it frequently occurs in Tibetan writings and books, that the vowel signs are removed from their proper places, on account of the dependent letters of the line above; several cases of this occur in your transcript. The intersyllabic points at the end of a line are generally also omitted, except with the conjunction དང་ which will also be remarked here. I have made a copy in Roman characters, and have also endeavoured to make a literal translation: the words in Italics I cannot properly interpret.

Om svasti, pronounced by the Tibetians *om soti*, is rendered by them in their language ཨོ་པཌེ་ལོགས་ལུ་བྱུང་ཅིག་ *om bdé-legs-su gyur-chig*: “Oh may it please, may it be prosperous.”

Inscription on the back of the wooden Board (fig. 3. Pl. VI.)

ཨོ། ཨོ་སྐྱུ་མྱི་ ལྷ་ལྷིན་ལྷེ་བཟླ་ རམས་ ཁད་དང་
ལོ་ལྷ་ལས་ རས་ཆེས་ལ་ དབང་བའི་ གནམ་ སྤྱི་ ཆེས་
ལྷ་ ས་ བདག་ ལྷ་ རིགས་ ལོགས་ལྷེ་གས་ པ་ གཙོ་ རམ་

influence upon the year, the lunation (or lunar month), and the different seasons or periods; ye possessors of the earth or land (land-proprietors), all the eight kinds of the Nágas (Hydras), &c. Ye powerful chiefs and attendants, VISHNU RÁHULA, and the menial (instrumental cause) Vis'hṭi; ye goddesses (or nymphs) *pi-ling-khraa ts-'ha*, &c.; ye fierce inferior imps, who dwell in (or towards) the cardinal, intermediate, zenith and nadir points (or in the ten corners of the world); and especially ye divine imps, &c. who are rulers of those regions, wherein the sun this day is moving; ye all look on this emblem (seal, image, or signed writ, &c.) of HU, the regent or governor, (or set up, or erected by HU.) Ye divine eight principal imps (Rákshasas), rulers of the world (or keepers of light), I beseech you, that you will make that this patron, the bestower of charitable gifts, for obtaining the fruit of his works and actions, who is very faithful to the doctrine of the Muni (SHAKYA), may together with his household or family, increase more and more, and abound in life, fortune, (prosperity,) honour, and in all his substance or wealth, like the increasing face of the moon. *Om akani nékani abhila mandala, mantryé, Sváhá; Sarva mangalam.*

Tettelia, 9th May, 1836.

A. C. KÖRÖSI.

III.—*Note on some of the Indo-Scythic Coins found by Mr. C. MASSON at Beghrám, in the Kohistán of Kábul. By JOHANNES AVDALL, Esq. M. A. S.*

[Read at the meeting of the 6th May.]

The results of the valuable researches of Mr. C. MASSON, Dr. MARTIN HONIGBERGER, Lieutenant BURNES, the late Dr. GERARD, and KERÁMAT ALI, in the vast field of the numismatology of ancient Bactria and other parts of India, must have excited a deep interest among the antiquaries of Europe. It must also be highly gratifying to the lovers of this important science on this part of the globe, to observe the unabated zeal and assiduity with which these researches are continued by eminent numismatologists, with a degree of success exceeding their most sanguine expectations.

Of the Indo-Scythic coins, discovered by Mr. C. MASSON at Beghrám, in the Kohistán of Kábul, and described in the 28th number of the Journal of the Asiatic Society, the one bearing the Greek legend NANAIA, has, it appears, attracted much attention. He is persuaded to think it to be identical with *Bibi Nanni*, or "the Lady NANNI," a name given by the Muhammedans to the numerous shrines or *Ziáráts*, as he calls them, found in those regions of Asia. The

Hindus also seem to attach to them a peculiar sanctity, claiming in the *Bibí Nanní*, a personation of their favourite goddess, *Párbatí*. These are all, however, mere conjectures, the real meaning of the Greek legend remaining yet to be explained.

In a subsequent number* of the Journal of our Society, a far different explanation of the Greek legend is given by its indefatigable Editor, which is, perhaps, a near approximation to its true meaning. There the goddess *NANAIA* is represented to bear a close analogy, in name and character, to the *Anaitis* of the Greek, and *Anahid* of the Persian, mythology. This hypothesis is based upon the authority of *STRABO*, quoted by Colonel *WILFORD*. A goddess called by the former *ANAIA*, is considered by the latter to be equivalent to the Sanscrit *Anáyasá deví*. But, how far the deity, recognised under the one or the other appellation, can be supposed to be identical with *NANAIA*, remains yet to be ascertained.

Anahid was the tutelary goddess of Armenia, during its continuance in the darkness of idolatry. She is also known in our mythological works by the names of *Artemis* and *Aphrodite*, being supposed to have sprung from the froth of the sea, and descended from *Zeus*, *Aramazd* or *Jupiter*. *Anahid* or *Anaid* is considered by us to be identical with the planet *Venus*, and the letters composing it being inverted, it reads *Diana*, which is equivalent to *Artemis*, by which name the goddess of hunting is invariably designated throughout all the Armenian books treating of the ancient mythology of our country.

The word *NANAIA*, or *Nanæa* distinctly occurs in the second book of the Maccabees: "For, when the leader was come into Persia, and the army with him that seemed invincible, they were slain in the temple of *Nanæa*, by the deceit of *Nanæa's* priests†." It was in the compass of the temple of this goddess, that *ANTIOCHUS* the Great was put to death. She is also called Անանայ *ANAIA*, or Նանաս *Naneas*, the genitive of which, according to the Greek termination, is written Նանայ *Nanea*. It has its derivation from the Persian language, literally meaning *maternal* or *motherly*. To the honor of *NANAIA*, or *Nanæa*, many temples were raised in Armenia, the most magnificent of which, according to the authority of Ագաթանգեղոս *AGATHANGELUS*, existed in a village called Թիլն *Thiln*, situated in Upper Armenia. This idolatrous temple was razed to the ground by *SURB GREGOR LUSAVORICH*, and a splendid church erected in its stead. Սուրբն Գրիգոր Թագաւորաւն հանդերձ իշխելն զոսկի պատկերսն Անահտական զիցն.

* Journal of the Asiatic Society for September, 1834.

† II Book of the Maccabees, chap. i., v. 13.

և ամենևին չտեղիսն քանդեալ վատնէին, և զոսկին և զարծաթն նուիրեալ : Եւ անտի ընդ գետն Գոյլ՝ յայնկոյս անցանէին . քանդէին զՅանէական մեհեանն՝ դստերն Արամազայ, 'ի թիլն աւանի . և զգանձս երկուց մեհենիցն աւար ժողովեալ՝ 'ի նուէրս ոք սպասու Եկեղեցւոյն Այ թողին . տեղերն հանդերձ :* “ Saint GREGORY and the king (TIRIDATES) broke down the golden images of the *Anahitic* deity, and reduced the temple to utter ruin, having divested it of the gold and silver belonging to it. Thence they crossed the river Goyle, and demolished the *Nanaiatic* temple, dedicated to the daughter of *Aramazd*, in the village of Thiln. The treasure contained in these two temples being collected, were appropriated to the sacred purposes of the church of God, to whom the spots were also consecrated.”

By the authority of this ancient historian, a philosophical inquirer will be convinced of the similarity of the characters of ANAITIS and NANAIA, and of the difference of their names. It is true that they were both the daughters of ZEVS or ARAMAZD ; but an identity of their persons cannot be inferred from this relative circumstance. The progeny of the father of the gods is supposed to be nearly as numerous as the offspring of the late lascivious monarch of Persia, and it is highly probable that *Anaitis* or *Anaid*, and NANAIA or *Nanæa* were distinct deities. This probability is borne out by the fact of there having existed in Armenia two distinct temples, in which these two goddesses were respectively worshipped by our pagan ancestors, under distinct appellations.

* This is an extract from the historical work of AGATHANGELUS, who is the oldest Armenian historian, being Secretary to the king TIRIDATES, and having flourished in Armenia in the beginning of the fourth century. *Anahitic* is a literal translation of Անահիտական, and *Nanaiatic* is exactly rendered for Յանէական, both used in the text adjectively. The derivative particle կան, attached to Անահիտ and Յանէա, is equivalent to the English particle *tic* ; for example, *Asia*, *Asiatic*, *Ganges*, *Gangetic*, &c.

NOTE.—MR. AVDALL was not aware that Dr. SWINEY had pointed out the coincidence of NANAIA with the *Nanæa* of Maccabees. This fact I added to my paper among the addenda of 1834. The name I afterwards found in HERBELOT'S *Bibliothèque Orientale*, (folio edition,) so that the identity that I had ventured to anticipate with the *Anahid* or *Anais* of Persia, and the *Anáyasá deví* of Col. WILFORD, was then considered to be perfectly established. MR. AVDALL'S note was elicited by Mr. MASSON'S conjectures as to the inscription at Bamyán, referring to the same deity. In Plate VI. of the April number, his sketch of the supposed characters is given ; but I can hardly yet feel assured of their being letters.—ED.

IV.—Notes on the Geology, &c. of the Country in the Neighbourhood of Maulamyeng (vulg. Moulmein). By Capt. W. FOLEY.

[Submitted at the meeting of the 6th May.]

The town of Maulamyeng is situated on the left bank of the Martaban river, the channel by which the *Than-lweng*, *Gyeng*, and *Attayen* discharge themselves into the sea. Properly speaking, Maulamyeng may be said to mark the junction of these three rivers, as the N. E. extremity of the town approaches to within a very short distance of the confluence of the *Attayen* with the *Gyeng* and *Than-lweng*; it would also be more in accordance with usage, if in the room of "*Martaban river*," (the name by which it has been hitherto known to the British,) the designation of "*Than-lweng river*" was given to the channel above-mentioned; the *Than-lweng*, being the largest of the three rivers, is entitled to the pre-eminence of holding an uninterrupted course to the *Gulf of Martaban*.

Immediately opposite to Maulamyeng, and separated from it by the *Martaban river*, (in this place about $1\frac{1}{4}$ mile wide,) are the northern end of *Phullughewn Island* and the town of *Mowtumma*, backed by a bold and interesting chain of mountains; to the north are the *Than-lweng river* and *Joe-ka-beng* range of limestone; while on the eastern and southern sides, the town and cantonment of Maulamyeng are bounded by the *Attayen* river, and a long line of sandstone hills, a continuation of the *Mowtumma* chain, which, leaving a passage for the river, re-appears at the *Kyeit-san-lan Phydá**, and is seen taking its course to the south to the right of *Gnang-dey* and *Gneedone*.

The general aspect of the country is mountainous, the mountains taking a N. N. W. and S. S. E. direction†. The most conspicuous of these, from its superior elevation, is the *Zingyet Thowng*, situated to the N. W. of *Mowtumma*; it attains an elevation of 3000 feet above the level of the plain, and is seen at a considerable distance by vessels approaching the coast; as might have been expected, the *Gulf of Martaban*, with the country in the neighbourhood of the *Sitang* river, were visible from a pagoda placed upon a pinnacle of the mountain, and to which I had ascended on a clear day. Great labour has been expended on this quarter of the *Zingyet Thowng*, with the view of making it more attractive, and rendering the ascent less irksome, than it would naturally have been from the precipitous nature of the rock: steps have been cut into the mountain, and the several projections

* Maulamyeng pagoda.

† The direction is exceedingly variable; it is sometimes N. W. and S. E., making a corresponding difference in the inclination of the strata.

removed or sloped away. A brick wall (about 3 feet high) extends on either side of the road from the foot of the mountain to one-third of its acclivity; this is succeeded by a dry wall, composed of pieces of rock placed loosely together, and continued to the top. The pagoda is small and void of all interior ornament; three handsome bells are attached to the court-yard, one of which bears an inscription, having reference to the period of its fabrication, and the various metallic substances of which it is composed.

Adopting the nomenclature of MACCULLOCH, the rocks under review are of the *primitive* and *secondary* class; all more or less distinctly stratified, and of a highly crystalline or compact nature. The *Zingyet Thowng* is principally composed of *gneiss*, and covered with a forest more or less thick, according to the depth of the soil on which it reposes; in places where the rock approaches the surface divested of vegetable mould, little or nothing is seen save a few stunted bushes and patches of parched grass, that had been produced during the rainy season; these become more perceptible as one advances towards the summit, which, with the exception of one particular spot, the site of the pagoda, and terminating in a peak, is either round backed or cristated. The interior of the *gneiss* presents signs of disintegration from constant exposure to the atmosphere; indeed, the rock is in some instances so decayed that it crumbles to pieces in the hand; but for the *stratification*, it might be taken for a species of fine grained *granite*: if I mistake not, *granite* has seldom been found stratified; *gneiss* will therefore be the more appropriate name. It must, however, be observed, that the stratification of the rock is in some places indistinct and irregular, the inclination of the strata being sometimes to the northward, and not unfrequently to the southward, of west. Under this *gneiss* probably repose the quartz-rock granite and mica slate found extending from the sea (in a N. N. W. and S. S. E. direction) towards the *Kyékmi* pagoda. I regret much that it was not in my power to ascertain, by a personal and minute examination, whether such is actually the case; my visit to *Kyékmi* was unfortunately confined to a short walk upon the beach, where these rocks are found lying in the following order; they are all regularly stratified, the several strata of no great thickness, but dipping into the ground at an angle of 75° or 80° ; commencing from the jetty, and advancing by the pagoda to the west, they were observed as follows:

1. *Red iron clay* (the result of decomposed sandstone?), enclosing nodules of *quartz*; this clay is *cellular*, of a ferruginous appearance, and has the property of becoming hard on exposure to the atmosphere. Q. Is this the *laterite* of the western peninsula?

2. White *quartz-rock*, alternating with
3. *Argillaceous schist*; blue or yellow, and slightly *talcose*.
4. *Quartz-rock*, white, or pale yellow, and containing a few scales of *mica*.
5. *Talcose-schist* with thin layers of *quartz*, alternating.
6. A white granite with *mica* abundantly disseminated in large yellow scales.
7. Pink, or red, *quartz-rock*.
8. A grey siliceous substance (resembling *chert*), with veins of *quartz*, and succeeded by
9. *Gneiss*, similar to that of *Zingyet*, but more decomposed, from the action of the salt water,—this is probably a continuation of the *Zingyet gneiss*.
10. *Red iron clay*; the same as No. 1*.

The above constitute the whole of the *primitive* rocks observed in the neighbourhood of *Maulamyeng*, and with which I am at present so little familiar: the *secondary* rocks, or those now about to be noticed, are of a different character, formed under other circumstances, and at a different epoch.

The first of these, is the *sandstone* of *Mowtumma* and *Maulamyeng*; with little variation in the line of bearing, the inclination of the sandstone strata is diametrically *opposite* to that of the *gneiss*, *quartz-rock*, and *mica-slate*, &c. It has been already shewn, that the strata of the last mentioned rocks dip to the *westward* at a very great angle, whereas the dip of the sandstone strata is generally to the *N. E.*, and the angle of inclination not exceeding 40° or 50°. This sandstone is more frequently white, presenting spotted delineations of a pink or red colour, and is, in some instances, so highly impregnated with *silica*, that it becomes difficult to distinguish it from *quartz-rock*. The less compact portion of the rock is generally intersected by veins of *quartz*. In many instances, the base of the sandstone is an argillaceous cement, impregnated with oxide of iron, which gives a red colour to the rock, and renders it more liable to decomposition; large masses of this substance are found either alternating with, or resting unconformably upon, the rocks of both classes; in the latter case, transported from its parent rock (the sandstone above noticed), and assuming the appearance of a hard ferruginous breccia†.

The sandstone hills have an undulating appearance, being free from the contortions and asperities peculiar to the limestone rocks in

* See Dr. BENZA'S observations on the filon of hæmatitic iron in the sienitic granite of the Neilgrís, vol. IV. p. 424.—Ed.

† This rock is the same as that noticed at Kyékmi, (No. 1.)

their neighbourhood. Attaining a considerable elevation, and running parallel to each other with a distance of some miles between each chain, these mountain ranges form extensive valleys, covered with water during the S. W. monsoon, and devoted for the greater part to the cultivation of paddy; what remains untilled abounding with long grass, the coarser kind serving for house-thatch, and the less rank affording pasture for cattle during the dry season. Except in the immediate neighbourhood of the limestone, where a fine black loam prevails, and on the banks of the rivers and islands formed by the constant accumulation of mud and silt, transported from a clay-slate and limestone country, the greater part of the soil found in the plains contiguous to *Maulamyeng* is an arenaceous clay, mixed with a small portion of saline and vegetable matter*.

The only ore that has been hitherto found in connection with the sandstone is a "*Sulphuret of Antimony*," in a vein of quartz; it is found in the neighbourhood of *Guangdey*, and appears abundant. Leaving *Maulamyeng*, and proceeding to the north, a few limestone hummocks are seen on the right banks of the *Than-lweng* river, forming part of the long but broken chain extending to the south-east viâ *Joe-ka-beng*, *Damatha*, *Nyown-beng-zeite*, and *Kyema-row*. With an aspect so different from that of the sandstone, these limestone rocks present peculiarities of structure deserving mention; although immediately succeeding the sandstone, the S. W. chains of limestone, or those first seen in contact with it, (advancing to the N. E.,) present little or no signs of stratification. The limestone appears in detached masses, rising, as it were, perpendicularly out of the earth; and as each mass preserves a similar direction with the one preceding it, the range has, at a distance, the semblance of an extensive chain, continually broken and interrupted by some great convulsion in nature. That the sea has covered the whole of this country, and probably at no very distant period of time, is perceptible at the first view. Four distinct epochs would also seem to be marked out. The two first will include the formation of the *primitive* and *secondary* strata; the third, the *up-heaving* of these strata; and the fourth, the presence of the sea upon the whole. The shattered and divided limestone, with its mural precipices and caverns; the saline depositions so constantly met with on the plains, and other appearances of a no less conclusive character, attest the former existence and desolating

* This saline matter is in some places so abundant, that the soil is collected by salt manufacturers for lixiviation; the liquid is strained off, and subjected to the usual process of evaporation.

power of the ocean*. As has been already observed, the sandstone rock is regularly stratified: the dip being (generally) to the N. E., and its angle of inclination from 40° to 50° : on the contrary, the limestone that immediately succeeds it is (to all appearance) unstratified, or the inclination of its strata discernable only from the fissures in the rock, so great, as to merit for it the appellation of *vertical*. It may, however, be remarked, that this peculiarity of structure is perceptible only in the *Joe-ka-beng* and *Mowmah* chains of limestone; advancing to the N. E., and passing another range of the sandstone before noticed, the stratification becomes more apparent, at the same time, that the line of bearing, dip, and inclination of the strata are exactly similar to the sandstone at *Maulamyeng*.

The general structure of the limestone is *mural*, possessing considerable height but little breadth; the angles of the projecting points are sharp, and as the little vegetation produced is restricted to a few stunted trees and shrubs, the rock has a remarkably rugged appearance.

The height of *Joe-ka-beng*, the most elevated point of the S. W. chain, is probably as much as 2000 feet above the level of the plain; it has a small pagoda on its summit, which on a clear day is visible at a distance of 20 miles; but with this elevation, its greatest average breadth will not be more than 300 feet. The limestone is of a grey or lavender-blue colour, sometimes presenting spotted delineations of white, yellow, ochre yellow, and red; of a fine compact texture, rarely granulated; fracture fine and splintery; faintly translucent on the edges; and frequently intersected by veins of calc-spar, corresponding in every essential point with the English "mountain limestone," or "*secondary limestone*" of Jameson. Another characteristic of this limestone is that it is *cavernous*. The caves are of considerable magnitude, and from their containing (occasionally) inscriptions having reference to the fabrication and sculpture of the several images and temples therein placed, are interesting both to the antiquarian and the geologist. The principal caverns are those at *Yétséy*, *Tyok-hla*, *Joe-ka-beng*, *Damatha*, *Nyown-beng-zeite*, and *Phabia*. Surrounded with jungle, these limestone caverns are not unfrequently tenanted by birds and beasts of prey. A great quantity of bat's dung is collected

* The *average* elevation of the plains above the level of the sea, at *high-water*, will not exceed six feet at the present time, while it is evident, on examination, that the banks contiguous to the sea, and subject to the influence of the tide, have been continually raised by successive depositions, and are still receiving deposits of silt or saline matter on every high rise of tide, or inundation produced by the freshes during the S. W. monsoon.

from the *Tyok-hla* cavern, and used by the natives in the manufacture of saltpetre.

Damatha Cavern, (western entrance,) situated on the left bank of the *Gyeng* river, and about 12 miles distant from *Maulamyeng*.

The mouth of this cavern is almost entirely closed by a brick wall: a small passage on the left affording entrance. It is spacious within, being about 220 feet long, 100 feet broad, and 25 feet high. The singularity attached to the cavern arises from its extending right through the hill, so that entering on the western side, one may pass out through the eastern mouth of the cave. The *stalactites* are numerous; several are of an immense size, and daily becoming larger from the continual supply of water, impregnated with calcareous matter, percolating through the hill, and giving a new crust to those already formed. *Stalagmites* likewise exist, but are generally much concealed from view by bat's dung, with which the floor of the cavern is covered. As is the case with all the larger description of caverns, that at *Damatha* is crowded with images of *Buddha* in wood and stone; he is represented in his usual sitting posture; in some instances, arrayed with the "*glories*," but more frequently without them. The workmanship is very inferior, and little attention seems to have been paid to the polishing of the stone, which is a fine crystalline marble, and naturally well adapted for sculpture. Exposed as these rude monuments of art are to the ravages of a damp atmosphere, as well as to the contamination of birds and beasts of prey, such extra labour would have been but fruitlessly bestowed; the natural white colour of the marble is either entirely defaced, or it has acquired the crystalline, reticulated appearance peculiar to the stalactite. Fronting the eastern entrance, and placed over the larger *Phyá*, is the following inscription written in the *Thalian* tongue, and specifying (as I am given to understand) the time that had elapsed since the cavern was first consecrated for the reception of the images*. The country was at that period in the hands of the *Péy-go†* government, and as marks of great age are evident throughout the whole of the works contained in the cavern, it is probable that some centuries have gone by since they were executed.

Passing out of the *Damatha* cavern on the eastern side, and following the limestone range to the south, a smaller cave may be observed within a few yards of the summit of the hill, which is in this place about 500 feet above the level of the plain; the ascent to it is extremely difficult, owing to the precipitous nature of the rock. A

* See note at the end of the paper and the inscription lithographed in Pl. X.—ED.

† Pegu.

large brick and mortar image of *Gautama* guards the entrance of the cavern, which measures 18 by 22 feet, while its average height will be as much as 20 feet. This small cave had been but lately selected by the *Phúngi*, for the better concealment of a quantity of manuscripts written in the *Thalian* or *Burmah* character, and secreted in the upper part of the *Damatha* cavern at a time that the country was invaded by the *Tshán**.

The manuscripts were placed in wooden boxes, elevated upon rafters; many had become perfectly rotten, and others were fast hastening to decay from constant exposure to damp.

It may be remarked, that curiously carved elephant's teeth were at one time to be found in these caverns, along with their less costly companions in wood and stone: these are now exceedingly scarce; the greater number have either crumbled into dust, or divested of the gilding and characteristic features of the *Buddhist* saint, have been exposed for sale in the bazar: some few have met with a better fate, and are probably now adorning the cabinets of the curious†. On a survey of the general devastation that prevails throughout these limestone caverns, it may reasonably be doubted, whether the hand of man has not proved equally destructive with time, and the elements, in obliterating much that had claim to notice by reason of superior antiquity, or novelty of design. The mutilated statues and broken shrines strewn around the caves too well attest the intrusion of other than *Barmah devotees*, and point out the havoc provoked by avarice, a fanatic zeal, or the more reprehensible disregard of what is due to the feelings of a conquered people.

Notwithstanding its exceedingly compact nature, perhaps no rock possesses the property of decomposition and solubility in water to such a degree as the limestone here treated of. Hence the rich plains in its vicinity, and the no less fertile islands continually formed and nourished by the carbonaceous particles transported from a limestone country by the *Than-lweng*, *Gyeng*, and *Attayen*. This tendency to wear is particularly manifest at the *Phabowng Thowng*, a limestone hill on the right bank of the *Attayen*, and not far removed from the site of the late town and fort from whence that river derives its name. A cavern may be observed in this rock that has evidently been formed by a mountain torrent, which, coming from the interior, rushes through

* Siamese.

† I was fortunate enough to obtain three of these teeth: they appear to be of an immense age; the ivory of the smallest tooth is completely decayed. I have also some of the manuscripts above alluded to, and reserve the whole for presentation to the Asiatic Society. (See Proc. As. Soc. 6th May.)

it to join its waters with the *Attayen*; with an average elevation of 15 feet above the surface of the water, and a diameter of nine feet, the cavern continues to cover the stream to the distance of 80 yards or more beyond its place of junction with the river. In the dry season, the stream is comparatively tranquil; but in the S. W. monsoon, when it is greatly swelled, and becomes tremendously rapid, it rises to the summit, and by its overwhelming force and the constant attrition of its waters on the limestone rock adds considerably to the dimensions of the cave.

Beyond the *Phabowng Thowng*, and on the right bank of the *Attayen* river, are the *hot-wells*. They are three in number, and about two miles distant from the old town of *Attayen*, of which nothing now remains save a few bricks to point out the site of the wall that surrounded it. A dense jungle of reeds and long grass covers the ground, extending to the *hot-springs* and the limestone rocks in their neighbourhood. The largest of the wells is of a circular form, and apparently deep; its diameter is probably as much as 60 feet. An efflorescence of the salt it contained was perceptible on the brick wall by which it is enclosed; the taste of the salt exceedingly bitter, not unlike that of "*sulphate of magnesia**." The spring was in a state of active ebullition, and much steam arose from its surface†; on the immersion of a therm. bulb, the mercury rose to 137° Fahrenheit. The springs evidently contained much rain water collected during the S. W. monsoon, and which, overflowing the banks, is disengaged by means of small rivulets that discharge themselves into the *Attayen*. Within a short distance of the hot-springs, I noticed water that had a dark colour, and a disagreeable fœtid odour, like that of "*sulphuretted hydrogen*;" this water was cold, although contiguous to the hot-springs. Both cocoanut and palmyra trees were numerous on the spot, and did not appear to suffer from their vicinity to the hot-wells; a fine young *pipal* tree grew luxuriantly on the bank of the largest spring: on the contrary, the trees situated near the water supposed to contain "*sulphuretted hydrogen*" were of a diminutive size, and had a sickly appearance.

Advancing beyond *Mowmah*, another or second range of *sandstone* is seen to cross the *Than-lweng* river, and take a similar direction with the limestone on which it reposes; the rock is of the same compact or siliceous nature as that of *Mowtumna* and *Maulamyeng*, but covered, for the greater part, by an upper stratum of red iron clay, accom-

* A bottle of the water, taken from the hot spring, has been presented to the Asiatic Society.

† When visited by me in Dec. 1835, at an early hour in the forenoon.

panied with *steatite*, a mineral not unfrequently found associated with this clay in other parts of the coast. This range is less wooded than the sandstone to the southward, and has the ferruginous appearance peculiar to the soil.

Approaching to the village of "*Hmeebong*," one cannot but be struck with the singular appearance of the limestone rock on the right bank of the *Than-lweng*: the limestone appears, as usual, in large isolated masses; but the form assumed by some of these is remarkably grotesque, at the same time, that the stratification of the limestone is more perceptible at this place than it has hitherto been. The following may be taken as a tolerably correct representation of these rocks, as seen from the neighbourhood of *Hmeebong*. (See fig. 2.)

Still ascending the *Than-lweng*, and passing the island of *Colon* by either channel, the river becomes more rapid, owing to the rise of its bed and the limestone reefs that cross it for several miles to the north; the eastern channel is that generally navigated: its left bank is high and precipitous, abounding with the cellular red iron clay so plentiful at *Maulamyeng* and *Kyékmí*: from its position, the clay appears to have been transported to its present site at a comparatively recent period, and *subsequently* to a change in the course of the *Than-lweng*; for it not only reposes *horizontally* upon the limestone rocks, but is found reclining upon a thick stratum of round pebbles and coarse gravel, in every respect similar to that found in the bed of the river at the conclusion of the rainy season*. This conglomerate is perhaps best viewed at an escarpment of the bank a little beyond *Chamyah*, and the great probability of its containing organic remains merits for it the particular attention of the geologist.

The limestone rock had been hitherto observed in broken but elevated chains on either bank of the *Than-lweng*, and with the exception of the few reefs before alluded to, seldom seen to stretch across and disturb the river in its progress to the south: leaving *Colon Island* and proceeding towards the *Yengbieng Kyowng* the case is far different; the country becomes more mountainous, at the same time that the rocks appear distorted and thrown about in the utmost disorder: it seems as if a chasm had been suddenly formed in the mountains, and a passage thus opened to the *Than-lweng*. Piled upon each other in the utmost confusion, the limestone rocks not only form a wall on either side of the river, narrowing its bed, and thereby adding to the

* This *change of course* might have been produced by the sudden deposit of the clay; and which accumulation and deposit can only be accounted for in the same manner as reasons are assigned for the singular appearance of the limestone rocks.

rapidity of the current, but spreading themselves across, obstruct its passage, and render the navigation extremely dangerous at any other time than the N. E. moonsoon. The current of the river is very strong near *Miang* and *Mye-an*, but the principal *rapids* are met with in the neighbourhood of *Towng-bio-myo*: I accompanied Sir J. Dickson, K. C. B., to this place in March, 1835, and we found it impossible for our boats to proceed further; indeed our return was not effected without considerable risk, owing to the force of the current, and the numerous eddies produced by the inequalities on the bed of the *Than-lweng*, which is in this place extremely deep. Accidents continually occur: a boat once drawn within the vortex of the whirlpool is inevitably lost; both boat and crew are sucked down, and never known to make their appearance on the surface.

At the mouth of the *Yengbieng Kyowng*, a spot rendered peculiarly attractive by the beauty of the surrounding scenery, the limestone is seen gradually passing into *clay-slate*; the limestone has a slaty fracture, becomes carthy, and is of a darker colour; the transition is at length so perfected (to the view) that but for the effervescence produced by the nitric acid, it becomes, in some instances, extremely difficult to detect the presence of the limestone in the argillaceous schist, with which it is intimately blended. At a short distance beyond the *Yeng-bien Kyowng*, a few blocks of a grey *siliceous* rock may be observed at the foot of a hill on the left bank of the *Than-lweng**; the hill is high, of a conical shape, and covered with a thick forest and under-wood. *Iron ore* is found in considerable quantities both on the hill, as well as in its vicinity; and small grains of *iron pyrites* are abundantly disseminated in the rock. This is succeeded again by the *slaty limestone*, and finally by the blue *clay-slate* that crosses the river at the *Towng-bio* rapid. Large masses of slate repose on either bank, surrounded by a micaceous sand and pebbles (consisting for the most part of *talcose slate*), brought down from the upper country during the S. W. moonsoon. A *dyke* of *porphyritic felspar* intervenes between the slate strata; the felspar rock is of a deep yellow, and studded throughout with small circular pieces of the same mineral, of a lighter colour. I regret much that I had not leisure to pay a proper degree of attention to the structure of this rock; our party arrived on the ground late in the afternoon, and we left the place early on the following morning; but short as was my stay at the *Towng-bio* rapid, I have often since dwelled in pleasing recollection, on the wild and

* The rock is extremely hard, and slightly impregnated with carbonaceous matter.

majestic scenery so bountifully bestowed by nature on this part of the *Kayeng-dho*.

A desire to become better acquainted with the geology of this part of the world induced me to pay a visit to the *Ayein Kayeng*. The following notes, having reference to the geology of that country, are extracted from my journal, with the view of rendering the description of the rocks before mentioned more complete.

“Leaving my boat at *Mye-an*, and advancing in a N. E. direction towards the village of *Yeng-bien*, a mass of regularly stratified limestone makes its appearance on the left of the road; it forms part of a broken chain extending N. N. W. and S. S. E. The stratification of the limestone is remarkably distinct; the dip of the strata E. N. E.

“Proceeding from thence up a dry nullah, covered with fragments of slate and sandstone, the ascent lay over the blue clay-slate that is first seen reposing on the limestone at the *Towng-bio* rapid. The slate is covered with a forest of fine young male bambus, runs parallel with the limestone, and may be as much as 900 feet above the level of the plain.”

“Bidding adieu to *Yeng-bien*, and advancing in the same direction towards *Mélayo*, *Tigunnéy*, (*Tshangelee*,) and *Bo-thowng*, the rocks are of the same nature as those encountered in route from *Maulamyeng* to *Towng-bio-myo*; viz. limestone, alternating with sandstone and clay-slate; the sandstone becomes extremely compact and siliceous in the neighbourhood of *Bo-thowng*; the limestone presents itself in the usual broken masses of various extent. But the clay-slate of *Bo-thowng* differs in colour from that of *Towng-bio*, being either pink or reddish brown, with a fine silky texture. The route from *Tigunnéy* to *Bo-thowng* is difficult and dangerous from the precipitous nature of the rock which is, at the latter place, as much as 2000 feet above the level of the plain. The ascent is also much impeded by the leaves and clay-slate pebbles profusely scattered about, and leaving little footing for the traveller on a path so inclined. Descending on the eastern side of the hill, the path (if it may be so called) lay over masses of the same pink-coloured slate, watered by a stream that precipitated itself over the rock, and rendered the descent a matter of no small difficulty; after proceeding a hundred yards or more, in that direction, the route lay to the left; a second ascent was here commenced, and passing a few heaps of stratified limestone alternating with the slate, I arrived at that part of the mountain called *Bo-thowng*: silver ore is said to exist in a limestone rock at this place, and judging from the numerous excavations that had been made by those in pursuit of the precious metal, no little labour has been used in the endeavour to discover it.

I had neither time nor opportunity for ascertaining whether silver ore *does* so exist; pieces of *copper green*, *iron pyrites*, and *lead ore**, deemed useless and cast aside by those in pursuit of silver, were strewed around the place, and for the first time, in this part of the world, I observed *Anthracite* dispersed in thin seams through the limestone rock. The figure of the limestone is not a little singular; emerging from the clay-slate at the upper part of the mountain, and confined to a line of 20 or 30 yards, the strata rise at a considerable angle, attaining an elevation of 90 or 100 feet, so that the exterior form of the limestone is that of a huge block, resting upon the hill, unconnected with any rock of the same class. This structure is common to the limestone throughout the whole of the *Bo-thoung* chain; but notwithstanding its peculiarity of form, the stratification is perfectly distinct; the dip of the strata being to the N. E. or E. N. E. precisely similar to that of the sandstone or clay-slate, with which it alternates."

The above notes were hastily arranged on my return from *Maulamyeng*; my residence at that place was necessarily short, and I am aware that much still remains deserving the attention of those who will possess the leisure and opportunities that I was not fortunate enough to enjoy. The field is stored with much that is valuable to the *Antiquarian*, the *Peteanist*, and the lover of *Natural History*. I trust that others will, ere long, lay before the public the treasures it contains.

Note.—The inscription brought by Capt. FOLEY, from the *Damatha* cave, is certainly the most enigmatical that has yet puzzled the antiquarian. I have lithographed it in Plate X., and with the assistance of RATNA PAULA, now furnish a copy in the Roman character:

Line 1.—sakkarak lri kun, 30—65 nahn, sakkarak lri kun, 4015061, nahn, sakkarak kun lri.

2.—50—45 nahn, sakkarak lri kun, 603304 nahn, sakkarak lri kun, 790 nahn, sakkarak

3.—lri kun, 370 nahn, sakkarak lri kun, 408—409 nahn, sakkarak, lri kun, 604—30 nahn nahn.

4.—sakkarak lri kun, 3096-5-0 nahn, sakkarak lri kun, 303—50 nahn, sakkarak lri

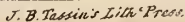
5.—kun 508309 nahn, sakkarak lri kun, 306060 nahn, sakkarak lri kun 60—303—5

6.—nahn sakkarak lri kun, 407—50 nahn, sakkarak kun lri kun, 6030304, nahn, sakkarak lri

7.—kun 401501 nahn, sakkarak lri kun, 305602 nahn, sakkarak lri kun, 503—704 nahn.

All that can be predicated of this curious text is, that it contains either some profound and unintelligible calculation, or that it is a

* On analysis, it appeared to be an "*arsenate of lead*."





chronological register of mythological times :—if the latter, the names of the reigning monarchs are omitted as immaterial, and the simple fact announced, “ in the year so and so, so many reigns ;”—but even this is conjectural, and unless errors have been committed in copying the figures, they do not run in any seeming order. The word *sak-kurák* is the Talain rendering of the Sanscrit *sakarāj*, year ; in Barmese written *sakkarèj* : the terms *lri kun* and *nhañ* are unknown to my informant.

J. P. Sec.

V.—*On the Revolution of the Seasons.* By the Rev. R. EVEREST.

In the Journal of April 1835, I gave the result of a comparison of the amount of rain-fall at Calcutta, with different positions of the moon, as far as regards her declination. The averages shew that a greater quantity of rain fell on the days when the declination was large, say from 20° to 28° , than when it was small. Now, as there are some years in the lunar cycle in which the declination never reaches to 20° , it followed, as a probable, though not a necessary, inference, that in those years there would be a deficiency of rain. Shortly afterwards I met with this note, (HUMBOLDT's *New Spain*, translated by BLACK, vol. ii. page 86.) “ TOALDO pretends to be able to deduce from a great number of observations, that the very rainy years, and consequently the great inundations, return every 19 years according to the terms of the cycle of Saros—*Rozier, Journal de Physique* 1783.” The recurrence seems here spoken of as an exploded error. I have therefore used whatever means lay within my reach to obtain information as to what really has been the variation of the seasons in this country for a long time back, and I will now state the results. But I must first premise respecting the note just quoted, that great inundations are not a necessary consequence of very rainy years. Should the rain fall regularly or equably, it will be less likely to occasion an inundation, than a much less quantity falling in a very short time. This will be more particularly the case in rocky and mountainous countries, where the channels are more easily choaked. In wide-extended plains, like those of the Nile and the Ganges, the rise of the river will form a more probable criterion of the amount of the rainy-season, though not a certain one. To revert, however, to the point proposed. The year 1829, was that of the minimum declination of the moon, and from the early part of 1827, to the end of 1831, the declination is never stated in the Almanacks at above 20° . For this, or rather for a period somewhat more extended, viz. from 1826 to 1833, inclusive, we have the following facts recorded.

1826, }
 1827, } Great drought in N. S. Wales ; Lieut. BRERETON's Travels.
 1828, }
 1829, }

1832. Public prayer by the Emperor of China for rain on account of extraordinary drought. Minimum of rain by Calcutta Register.

1833. Great drought through all the Upper Provinces, extending from Bundelkhand to Kashmir.

Let us next turn to Mr. KYD's Register of the Height of the Huglí, (see Journal, April, 1835;) and as that has been objected to as evidence, I must be allowed to say a word in its defence. It is true that the level of the Huglí at Calcutta is affected by the tides in the Bay ; but according to Mr. KYD's account, such an occurrence is very rare, an inundation from the sea not happening more than once in a century. Remembering then that the ninth year before 1829 or 1820, was that of the moon's maximum declination, we find that the three or four years immediately before or after that were higher, on the average, than those farther off. Again, if we take 1811, the ninth year before 1820, and 18 years before 1829, we find that in the years nearest to it the river was lower than in those farther off. If we take the joint evidence of the height of the river, and the Calcutta register, we may assume that 1813 was the minimum year of rain ; the 10th year after that or 1823, was the maximum year of rain : and in the ninth year again after that, or in 1832, came a minimum again ; a period of 19 years, or a complete lunar cycle, having intervened between one minimum and its succeeding one.

With a view of ascertaining whether such a variation held in other localities, I obtained from the collector's office here, a memorandum of the character of the seasons as to rain for 21 years back. It was dictated from memory by an old native officer of the establishment, who would of course have the records of the office to refer to ; and these in a climate where the crops depend so much upon the quantity of rain, would of themselves be a tolerable guide.

It begins thus : 1812, great drought ; 1813, moderate ; 1814 to 1823, (both inclusive, a period of 10 years,) four years very abundant, four years, abundant, two years moderate. From 1824 to 1833, (both inclusive, a period of 10 years,) one year very abundant, two years abundant, three years moderate, three years, drought ; one year, 1833, great drought. The seasons of great drought are here placed 21 years apart, instead of 19, as in the former case. Evidence of this kind, like that from the height of the river, though not free from objection, can hardly be deemed unworthy of credit, when it is corroborated from other sources. There is one advantage, however, which

information of the two kinds above-mentioned, possesses over the results of a solitary rain-guage, however carefully kept, viz. that they are an index, imperfect as they may be, to what has happened over a large tract of country; whereas the rain-guage can only inform us as to one particular spot, and rain-guages in general are so much affected by peculiarities of situation, that the results afforded by any one singly, must be considered as liable to doubt. To obviate this objection, I have placed together in a table all the different series procurable, of a date posterior to 1820, (see Table No. 1.) Most of them are to be found in the different Nos. of the Journal; and the localities are between Dacca, (E. Long. 90° .) and Delhi, (E. Long. 78° .) between Nagpur, (Lat. 21° , North,) and Delhi, $28^{\circ} 40'$ (N.) To these are added the observations at Madras, which I have obtained through the kindness of the Astronomer there; at Macao, in China, (Journal, July, 1832,) and at Edinburgh, (see BREWSTER'S Philosophical Journal, *passim*.) In Table No. 2, are given the only three series that I have for the years between 1800 and 1821. The two first (Madras and Macao) are merely the preceding parts of the series given in Table 1. The last from Carlsruhe, in Sweden, is given in the Edinburgh Philosophical Journal for 1821, there quoted from the *Bibliothèque Universelle* for November, 1820. The original appears to be given in French inches and lines, and I have not reduced them to English measure, as the doing so would not affect the question at issue, viz. whether some years of the lunar cycle are more rainy than others. Now to make a more correct comparison of the different years, we must first reduce the numbers given in Table 1. to a common mean. Thus, we have Dacca for eight years, (1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834,) and the mean of the different sums given is $72\cdot80$ inches; at Calcutta, for the same eight years, the mean is $60\cdot37$ inches. The difference between these, $12\cdot43$ inches, we may reasonably suppose to be owing to the localities. Subtract, therefore, from each item of the Dacca series, the mean difference $12\cdot43$; the remainders will be reduced to the mean of Calcutta*. Proceed in a similar way with the other series, only of course where the climate is drier than that of Calcutta, the mean difference must be added, and not subtracted. The series in Table No. 2, may be included in the comparison by treating them in a similar way, and then considering them only according to their position in the lunar cycle. Thus, if we take 1821 for the first year of the cycle, 1803 (or the eighteenth year before that) may also be reckoned as the first year; 1802 and 1820, will of course be the last years. Place the whole in columns numbered according to their distance from 1802 and 1820, and an average may be taken

* The more correct mode would be to multiply the Dacca series by $\frac{60\cdot37}{72\cdot80}$. —ED.

of the whole, as in Table, No. 3. From this it appears that the average of nine years nearest the maximum is 66·34 inches, and of nine years nearest the minimum, 61·21 inches, making a difference of 5·13, or nearly $\frac{1}{13}$ th of the whole between the two periods. If it be objected, that such a difference is too trivial to be decisive, we may answer that the difference shewn in the table is less than the real one. In all the series, except those of Dacca and Macao, a quantity has been added to bring them to the mean of Calcutta, and of course where two quantities differ, and a third quantity is added to each, they are brought nearer to a ratio of equality*.

Secondly, if we consider each series separately, (see Tables 1. and 2,) we shall find that each confirms the opinion of the years of maximum declination being the most rainy, except the Macao one, in which the reverse holds good. Thus the average of 1812, 1813, 1814, and 1815, (four years near the minimum,) is 80·50 inches. That of 1816, 19, 20, 21, 22, 23, 24, (seven years about the maximum,) is 61·46. Again, that of 1825, 26, 27, 28, 29, 30, 31, (seven years about the minimum,) is 71·00 inches. So that this guage, as well as the others, favours the idea of a recurrence contemporaneous with the recurrence in the lunar cycle. We may here remark, that the idea of certain localities reciprocating, or experiencing at the same time contrary variations of climate, appears, at first sight, more probable than that the quantity of precipitation over the whole globe should be abundant for a series of years, and then deficient, the great cause of evaporation, viz. the heating power of the sun, remaining all the while the same.

It will be noticed, that among the series are two from northern Europe (Edinburgh and Carlsruhe). The inference might have been drawn without them, but they were added, as being the only others of any length I had at hand, to complete the cycle. Notwithstanding the testimony of the Swedish guage, it is very doubtful whether such a variation as is there shewn is general over Europe. I say so: First. Because of the way in which the idea is treated in the note from HUMBOLDT above quoted. Secondly. From the silence of modern writers in meteorology respecting it. Thirdly. What English registers I have been able to examine (and they are for short periods, not above three or four years) do not shew a preponderance of rain towards the maximum declination of the moon, but rather the reverse; so that, from that, as well as from other sources of information, we might conjecture the variations there would rather agree with those of the Macao guage, than of the Indian ones.

In naming the places visited, either just before, or after the year 1829, by drought, the following was omitted: " During the three

* This would have been obviated by following the course mentioned in the note, page 283.—Ed.

years prior to 1834, there had been a complete drought, which had brought a famine upon these islands, and, in consequence, some thousands of the inhabitants had died.”—Sketches of Cape de Verd Islands.—United Service Journal, July, 1835. As these islands lie in a latitude between that of Calcutta and Madras, the fact is interesting, but I have no accounts to refer to for the state of things during that period, in the intervening countries of Egypt, Abyssinia, Arabia, and Persia.

Lastly. It will be objected, that a regularly ascending and descending series has not been made out.

This is true; but as the number of series from which to take the averages has increased, so has the tendency to it become more apparent. There is one circumstance, however, which may serve to prevent a regular ascent and descent from ever becoming perceptible, viz. the place of the perigee. Having been lately engaged in an examination of barometric heights with regard to this, I have noticed that the average amount of variation from the mean, either in excess or defect, is greater about the time of perigee, as it also is about that of maximum declination. Now there are some years in which the day of perigee coincides about the solstices with that of maximum declination, and these years are usually the extreme ones, both of moisture and drought. I subjoin a sample.

	Perigee and Max. North Decl. 1814-1815.	Perigee and Max. South Decl. 1818-1819.	Perigee and Max. South Decl. 1822-1823.	Perigee and Max. South Decl. 1826-1827.	Perigee and Max. North Decl. 1831-1832.
Calcutta,			77.2	55.42	50.25
Madras,	32.27	77.08 27.62	26.61	88.67	20.07
Macao,	95.70		55.70	51.80	

The three numbers in the Calcutta guage are, one, the highest, and two the lowest up to 1833; the six numbers in the Madras guage are the four minima and two maxima noted up to the same period. Of the three numbers from the Macao guage, one only is an extreme, but the other two are very large either way. Some other circumstances, also, would lead to the belief, that peculiar localities receive the changes both of drought and moisture earlier than others. Thus the last drought was at its height in Bengal in 1832, and also at Madras; but it did not reach either Delhi or the Nilgherries to the westward until 1833. This of course introduces a new source of confusion.

There is one other way of attempting to trace the variation of the seasons, and that is by a comparison of the prices of corn in different years at different places; but this must be deferred for the present.

TABLE No. 1.

Shewing the Annual Sums of Rain in inches that have fallen in different places in different years since 1820.

	1821	1822	1823*	1824*	1825	1826*	1827	1828	1829	1830	1831	1832	1833	1834	1835
Calcutta,.....	77.20	67.30	..	55.42	64.56	57.29	59.73	63.24	58.78	50.25	60.36	68.73	85.50
Dacca,.....	74.00	46.80	80.80	93.90	89.00	66.70	62.80	68.00	..
Bancoora,	46.78	69.57	57.68	43.62	..	..
Nagpore,	65.61	53.99	46.61	50.25	33.00	65.31	37.14	..	..	..
Sagur,.....	31.20	46.60	32.00	64.80	..	..	..	..
Futtehpoor,	42.83	33.72	26.28	42.45	..	..	..	..	..
Delhi,	14.1	36.85	27.70
Madras,	47.12	58.84	26.61	33.21	55.94	60.71	88.67	37.89	37.09	34.41	40.30	20.07	36.95	40.17	37.26
Macao,	68.40	63.60	55.70	68.60	73.30	79.80	51.80	104.60	59.30	52.90	75.30	..	..9	..	..
Edinburgh,.....	24.64	22.42	15.27	32.59	25.23	29.86	35.20	24.83	..	..	..	..

NOTE.—In the years marked with an asterisk the Calcutta Registers are partially defective, and have been supplied from the averages.

TABLE No. 2.

Shewing the Annual sums of Rain that have fallen at different places in 20 years previous to 1821.

	1801	1802	1803	1804	1805	1806	1807	1808	1809	1810	1811	1812	1813	1814	1815	1816	1817	1818	1819	1820
Madras, .....	..	..	66.10	31.11	31.21	61.46	54.22	..	..	..	..	..	45.65	32.27	53.55	40.07	63.72	77.08	27.62	70.09
Macao, .....	..	..	..	..	..	..	..	..	..	..	..	107.30	54.50	95.70	64.50	18.80	..	..	59.00	65.90
Carlsruhe, ..	33.80	24.00	28.00	30.10	28.70	26.60	..	26.00	25.50	26.00	21.60	21.00	25.10	19.24	19.40	31.06	26.51	21.84	..	..

TABLE No. 3.

Shewing the comparative quantities of Rain that fell in different places in different years of the Lunar Cycle, the years 1803 and 1821, (or those next after that of Maximum Declination,) being taken as the first of the Cycle, and the whole being reduced to the mean of Calcutta.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Calcutta,.....	..	..	77.20	67.30	..	55.42	64.56	57.29	59.73	63.24	58.78	50.25	60.36	68.73	85.50	..	..	..
Dacca,.....	..	..	..	..	..	..	61.57	34.37	68.37	81.47	76.57	54.27	50.37	55.57	..	..	..	..
Bancoora,.....	..	..	..	..	..	..	..	..	..	50.53	73.32	61.43	47.37	..	..	..	..	..
Nagpore,.....	..	..	..	..	..	72.66	61.04	53.66	57.30	40.05	72.36	44.19	} *		..	..	..	..
Sagur,.....	..	..	..	..	..	..	..	47.31	62.71	48.11	80.91	..	..	..	..	..	..	..
Futtehpoore,.....	..	..	..	..	..	..	67.71	58.60	51.16	67.33	..	..	..	..	..	..	..	..
Delhi,.....	..	..	..	..	..	..	..	..	..	..	..	..	59.48	82.18	73.03	..	..	..
Edinburgh,.....	..	..	..	..	..	..	66.69	59.33	63.96	69.30	58.93	..	..	..	..	..	..	..
Madras,.....	83.38	48.39	48.49	78.74	71.50	..	..	..	..	..	62.93	49.95	70.83	57.35	81.00	94.36	44.90	87.37
	64.40	76.12	43.89	50.49	73.22	77.99	105.95	55.17	54.37	51.69	57.58	37.35	54.27	57.45	54.54	..	..	..
	..	..	..	..	..	..	..	..	..	101.30	48.50	89.70	58.50	42.80	..	..	..	..
Macao,.....	62.60	57.60	49.70	62.60	67.30	73.80	45.80	98.60	53.30	46.90	69.30	..	..	..	..	..	53.00	59.90
Carlsruhe,.....	66.24	68.34	66.94	64.84	..	64.24	63.74	64.24	59.84	59.24	63.34	57.44	57.64	69.24	64.74	60.04	71.04	62.24
Average,.....	69.15	62.61	59.24	63.78	67.13	65.58	67.13	58.73	58.97	61.68	65.68	53.83	57.35	61.90	71.76	77.20	56.31	69.84
Average of years,....	1, 2, 3, 4, 5, 15, 16, 17, 18,.....	66.34	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Average of years,....	6, 7, 8, 9, 10, 11, 12, 13, 14,.....	61.21	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Difference, .....	.....	5.13	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..

* The last No. of the two included within the brackets is for the year 1814 (see Journal As Soc. vol. II, 239. Climate of Nagpore).

VI.—Recent Discovery of Fossil Bones in Perim Island, in the Cambay Gulph.

[Read at the meeting of the 1st June.]

The following notice of the interesting discovery of this new deposit of fossil bones has been obligingly communicated to me in a letter from the Baron HUGEL, dated at Bombay the 17th April. Although its publication anticipates the arrival of the specimens themselves, it would be an injustice to science and to Dr. LUSH to delay for a moment so important an announcement. The acknowledgments of the Society are due both to the discoverer and to the Baron HUGEL, for the preference given to our museum for their preservation. I hope the circumstance may lead to fresh exertions in the valley of the *Narbada*, where doubtless much still remains to be explored.—J. P. Sec.

“ You will receive shortly a few fossil bones from Perim Island, in the Cambay Gulph. Dr. LUSH has the merit to have found them, but without exploring them at all. I had no time to go over from Surat, where Dr. LUSH showed me them. I requested him to send them to you through Mr. WATHEN. One is an imperfect bone of a mastodon or elephant—another the head of a boar unknown, and one belonging, I think, to a ‘*Rongeur*,’ but what induces me particularly to wish them at Calcutta is, that there is a horn in its matrix, which, connected as these fossils must necessarily be with those of the *Narbada*, might belong to that species of *Bos* mentioned in your Journal: it is decidedly not of a Buffalo. I was so anxious to reach Bombay, that I could not possibly go to Perim myself. I did however manage to send a boat over; and I received yesterday 41 pieces of fossil bones: the greater part belonging to the *mastodon latidens*, of which the teeth, in a perfect state, did not leave any doubt; some of the bones are of an immense size, one fractured piece of the tusk measuring from the centre to the outside of the circle $5\frac{1}{4}$ which gives $10\frac{1}{2}$ inches diameter, or 34 inches in circumference: some of them are in the same hard matrix you will see imbedding the horn; some evidently rolled by the sea. There are some curious teeth among the fragments I possess, and two triangular shaped pieces similar to the horn of a rhinoceros: the teeth are however too large to belong to that animal. I may perhaps send the most curious specimens round to you; but I am at this moment too much pleased with my discovery to part with them. It appears that the island abounds with fossils, and it is a clear proof either that the *Narbada* must have found only lately its way to the Cambay gulph, or that some other revolution must have

separated the little island from *Kattiwár*. Having no opportunity to leave this for either Persia or the Cape, I may still perhaps be able to go to Perim and Gogo, to trace the fossils on the main land of the peninsula.”

HUGEL.

Since the above was set in type, and just before striking off the sheet, I have been favored with the subjoined additional information from a new correspondent, Lieut. FULLJAMES, which I hasten to make known through the Journal, while I venture to assure him the thanks of the Society for his projected exertions to enrich its museum. Who will not become an enthusiast amid such discoveries? It is but four years since the existence of strata containing fossil bones was denied in India, or at least supposed to be confined to Assam and Ava. We are proud to think that the Journal has been in some measure the humble means of stimulating the search which has been thus crowned with success in so many quarters.—ED.

“On my arrival in this part of the country in the month of April, I heard a report that some bones, turned into stones, as the natives called them, had been discovered on the Island of Perim in the Gulph of Cambay, and in latitude $21^{\circ} 39'$.

I lost no time in going there to see if the report of fossil remains was correct, and although I do not pretend to be a geologist, or to know much about fossil osteology, still I consider my labours most amply repaid, by my first visit to the island; for I obtained a most perfect specimen of the teeth of the mastodon; one also that I think belongs to the palæotherium; and the femur, vertebræ, and many other bones belonging to mammiferous animals now extinct.

Being well aware from the perusal of your scientific Journal, how highly, and I might say justly, remains of this sort are prized, I shall take the liberty of forwarding to the Society for their acceptance a box containing specimens of these fossil remains.

The formation in which they were discovered is a tertiary conglomerate, composed of nodules of sandstone, indurated clay, and a small proportion of silex, cemented together by a yellow clay; most of the fossil remains have been exposed to view, by the sea having washed off the upper part of the matrix, but still they are firmly attached to the rock, and the only way they were to be obtained, without breaking, was by stone-cutters carefully working all round them; large quantities of petrified wood were lying about in every direction.

The following is a list of the strata as they appeared to me, commencing from the surface, viz.

1st. Loose sand and earth.

2nd. Conglomerate, composed of sandstone, clay and silex.

- 3rd. Yellow and whitish clay, with nodules of sandstone.
- 4th. Conglomerate as above.
- 5th. Siliceous sandstone with a few fossils. (Calcareous.—ED.)
- 6th. Conglomerate.
- 7th. Indurated clay more or less compact.

8th. Conglomerate, in which the best, and I may say nearly the whole of the fossil remains have been discovered.

The deepest strata of conglomerate are about 3 feet, but they generally do not run more than 18 inches to 2 feet, and for the most part lie horizontal. On the western side of the island, however, the strata are much disturbed, being fractured, and dipping at an acute angle to the east; on the southern end of the island, sandstone appears below the fossil stratum of conglomerate, dipping to the north at an angle of 25 degrees.

There is a tradition among the inhabitants of Gogah, that the island of Perim was formerly joined to the main land, by means of a stone bridge, which has, in the course of time, been destroyed; remains of some buildings are still to be seen, running into the sea in the shape of piers, &c. It must have been a very stupendous undertaking, for there is a channel now between the land and the island of the depth of 75 fathoms, and nearly 500 yards in width.

On the island there are the remains of a considerable fort, and buildings of Hindu architecture, for I observed in an old temple that had tumbled down, the broken figure of Buddha rudely sculptured in a sitting posture; also the remains of a large tank wall, and *bauli*. Among the other curiosities of the island are two elephants cut out in the rock; they are covered now by the sea except at very low water; one is finished, and I should say, measured about 10 feet long by 8 or 9 feet high. Capital fresh water is procurable on the island, 20 feet below the surface; it is found below the stratum of sandstone.

I will here enumerate the varieties of specimens of fossil remains, which I think have been found. Teeth of mammoth; ditto mastodon, palæotherium, hippopotamus, or rhinoceros, and a number of other smaller animals. The head of some large saurian animal; part of a tortoise; ditto of elephant's tusks. Femora, vertebræ, and other large bones; one shell in siliceous sandstone, and the half of a deer's foot. With this vast variety before me, it requires a person much better qualified than myself in the art to say to what particular animal the different specimens belong, and I therefore forward them with the hopes of hearing the opinion of the scientific in Calcutta.

It has occurred to me, on reading over the Journal for Aug. 1834, that the conglomerate in which the fossil remains in the valley of the

Nerbudda have been discovered, is very nearly similar to that in which the Perim fossil are found ; and if my conjectures are correct, we shall be able to trace the formation along the whole line of the Nerbudda valley and the greater part of the Kattíwár coast. Should such be the case, and I have but little doubt in my own mind that it will be so, what a vast field has thus been thrown open, for discovery and research ; I still hope to see my conjectures fulfilled with regard to finding coal in the Tajpipla or Kattíwár range of hills before the lapse of many years.

Not wishing to take the credit to myself of having been the first person to discover these remains, I should mention that I believe Dr. LUSH was the first ; he having, I understand, found a tusk of some animal on the island. During a second visit to the island, I was accompanied by three other gentlemen, who have most kindly given me permission to forward any part of the specimens so obtained, that I think may be acceptable.

Doubtless on further research and on breaking up the stratum, more perfect specimens of bones will be discovered : for I must mention that all those sent were covered at high water, the highest point of the island not being above 60 feet higher than high water mark ; the length of the island is about $1\frac{1}{2}$ miles to 2 miles, and in breadth $\frac{1}{2}$ to $\frac{3}{4}$ mile ; large sand hills are formed on the south-west side, and it is inhabited by about 12 houses of coolies, who cultivate bájri there during the monsoon. A light-house has been established there for some years, and kept up by the Government, of which a serang and five lascars have charge : the expenses are defrayed by levying a duty on all boats passing.

Should I be able to make any further discoveries either in fossil remains, or as to the formation of the Kattíwár hill, I shall trouble you with a further communication ; that is to say, should you consider the present worthy of occupying any part of the pages of your interesting Journal.

GEO. FULLJAMES."

VII.—*Table of Sub-Himálayan Fossil Genera, in the Dádúpur Collection.*
By Lieuts. W. E. BAKER and H. M. DURAND, Engineers.

The following table is intended to illustrate the proportion in which the respective genera have been found to occur, and is deduced from the specimens in our collection.

The results might have been presented in a more simple form by confining the table to the two last columns ; but as information with regard to the number of perfect and imperfect specimens on which

the entries admitted into these columns are based may be deemed interesting, the following headings under which the specimens were counted off are also given.

*Crania*s, which title includes all specimens showing a considerable portion of the head.

Upper Jaws. Allotted to such palates as possess either one or both lines of molars complete.

Lower Jaws. Under this heading are numbered those lower jaws which are perfect, and also such as, though wanting the symphysis, present the line of molars complete. The shape of the lower jaws of the ruminantia renders them very liable to fracture immediately in front of the molars; accordingly, a great number of half jaws are found, which, being deprived of their symphysis, afford no means of accurately joining together such of them as may have belonged to the same individual. Some pairs may therefore have been overlooked; an error nearly inevitable, and which would account for the apparent excess of lower jaws in proportion to the upper.

Fragments of Upper and of Lower Jaws. Within these columns, as the heading imports, fragments of maxillaries, containing one, two, or more molars, and also those detached molars, the maxillaries of which are not in the collection, have been ranged.

As the table enters into no detail of species, the latest discoveries which it comprises may be cursorily noticed. These are a very perfect cranium and lower jaw of a species of *Vulpes*; an equally perfect cranium and lower jaw of a species of the genus *Gulo*; also an addition to the *Pachyderma*, consisting of the anterior half of a head, of which the posterior half was unfortunately broken off; and owing to the carelessness of the excavators, none of the fragments have hitherto been recovered. The lower jaw is locked within the upper; so that the exterior surface, and the outline of the upper molars can alone be examined; the characteristics of the teeth being thus imperfectly developed, and the occiput wanting altogether, the specimen has been inserted in the table under the general title "*Cuvierian Pachyderma*:" by which, however, there is no intention of conveying the idea that it has been identified with any of the *Pachydermata* of the Paris basin; for although it affords some analogies both to the *Palæotherium* and to the *Anoplotherium*, its essential peculiarities are sufficiently remarkable to cause it to be separated from either genus.

In the present early state of the search, the accompanying list can only be considered as an approximation to the relative numerical proportions in which the different fossil genera existed. Viewed as such, it tends to prove that species of the genera *Elephas*, *Mastodon*, *Hippopotamus*, *Cervus*, *Antelope*, and *Bos*, were abundant; that the genera

Rhinoceros, Equus, Sus, Canis, and Hyena, were of less frequent occurrence, and that the Camelidæ and the Sivatherium were rare. The habits of these genera may be adduced as reasons for modifying this general summary of the state of a former zoological period.

NOTE.—Having been favored with the perusal of the forthcoming papers on the Hippopotamus, in the Asiatic Society's Transactions, it becomes requisite to remark, that the specimen placed under the genus Anthracotherium is the same which in a note at page 59, is considered by Dr. FALCONER as belonging to a new genus, Chærotherium. In our opinion, it is a new species of Anthracotherium, under which we have accordingly numbered it. Mr. DAWE has brought to our notice a specimen in his possession, which consists of the right half of a lower jaw belonging to the *Hippopotamus Dissimilis* of Dr. FALCONER and Captain CAUTLEY. It is valuable as showing two molars which have suffered but little detrition, and which, instead of the tapering conical collines, with summits close to each other, as in the large Hippopotami, has its colline apices widely separated, the tapering taking place from the point of contact of their bases outwards: the outer side of each colline is nearly perpendicular, and from the manner in which the sloping and the upright surfaces meet, the colline top loses the mammillar aspect, assuming a flattened almost trenchant form. The wear indicated is the same as that described in the paper above alluded to.

Table of Sub-Himálayan Fossil Genera.

Class.	Order.	Genus.	Craniums.	Upper jaws.	Lower jaws.	Fragment upper jaw.	Fragments lower jaws.	Total upper jaw.	Total lower jaw.	Remarks.
Mammalia,	Feræ,	Ursus ?	0	0	1	0	0	0	1	
		Canis,	3	0	6	2	1	5	7	
		Hyena,	2	0	4	9	15	11	19	
		Felis,	2	0	0	0	2	2	2	
		Gulo,	1	0	1	0	0	1	1	
		Mus,	0	1	0	0	4	1	4	
	Glires,	Hystrix,	0	1	0	1	1	2	1	
	Pachyderma,	Elepbas,	9	6	22	46	31	61	53	} 56 doubtful mutilated fragments omitted.
		Mastodon, ..	3	6	28	39	31	49	59	
		Hippopotamus,	11	14	20	21	43	46	63	} Cuvierian.
		Sus,	3	5	7	4	3	12	10	
		?	0	1	1	0	0	1	1	
		?	0	0	0	2	0	2	0	
		Anthracotherium,	0	0	0	0	1	0	1	
		Rhinoceros, ..	3	3	7	18	6	24	13	
		Equus,	0	0	2	20	14	20	16	
	Ruminantia,	Sivatherium, ..	0	0	1	8	8	8	9	} Many doubtful fragments not counted.
		Camelus, ...	1	0	1	1	2	2	3	
		Cervus,	3	31	17	25	84	59	101	
		Antilope,	8	18	35	8	45	34	80	
		Bos,	2	3	12	35	25	40	37	
Reptilia,	Sauria,	Gariala,	0	0	0	0	0	0	0	5 fragments.
		Crocodile, ..	0	0	0	0	0	0	0	3 fragments.
	Chelonia,									} 5 whole—many fragments of both Emys and Trionix
		Emys,	0	0	0	0	0	0	0	
Pisces,			3	0	0	0	0	3	0	

VIII.—*Note on the Teeth of the Mastodon à dents étroites of the Siwálik Hills.* By Captain P. T. CAUTLEY. Pl. XI.

[Read at the meeting of the 1st June.]

Without further preface I refer the reader to the 1st volume of the *Osemens fossiles*, page 268. Figures 1 and 2, plate 4, under the head of “*Divers Mastodons.*”

These drawings were presented to CUVIER by M. FAUJAS, and the fossil was found near Asti in Upper Italy.

CUVIER merely alludes to this fossil as one of the varieties into which the true *Mastodon à dents étroites* passes by a greater subdivision and an irregularity of position of the mamillæ; the proportions of length to breadth of the tooth retaining their full and perfect character.

By comparing the accompanying drawings with the figures above alluded to, there can be no demur, I imagine, in identifying the Siwálik variety of *Mastodon* now under review with the Asti fossil. It remains therefore simply to note the peculiarities in form of the tooth: although it may be a point of consideration hereafter, whether, as the character of the tooth is so marked, and its peculiarities so rigidly adhered to throughout the whole of the remains found in the Siwálik, it may not be placed under a sub-genus, that of “*angustidens*,” with the specific denomination of *M. Sivalensis*.

There is no cortical substance or crusta petrosa; the tooth consisting of enamel and ivory only, the former being very thick and massive, as is normal in the mastodons.

The coronal surface consists of a double line of conical and obtusely pointed mamillæ: those on the external side being in most cases perfect, whilst those on the inner side are divided by a fissure or fissures into two or three irregularly formed obtuse points. These mamillæ are not, as in the true *Mastodon angustidens*, placed transversely or at right angles with the line of surface, but meet each other from right to left alternately, so that the furrow on one side is interrupted by the mamilla on the other; and the mamillæ on the whole line of tooth lock into each other in the same way that two serrated edges opposed to each other might be supposed to do, were they placed in contact.

The outer surface of the enamel is smooth, and the space or furrow between each mamilla both on the external and internal surface is marked by a small tubercle, the presence of which however does not appear to be constant.

The surface of the tooth of the lower jaw wears obliquely and outwardly on the grinding surface, as in the ruminants, in which respect it differs entirely from the elephants.

The wear of the coronals is marked at the commencement by irregularly lobed figures, which, as the detrition advances, become confus-

ed, and gradually unite, until the mamillæ are worn away entirely, when the tooth is left with merely a surface of ivory surrounded by enamel.

The drawings are intended to represent the tooth at these different stages; from the state of germ, to the old and worn down tooth, shewing the intermediate state of detrition at different ages.

Pl. xi. Fig. 1. Fragment of tooth in germ, with the enamel on one of the mamillæ fractured.

Fig. 2. A very perfect molar of a young but adult animal, the front surface being moderately worn, and the rear portion in the state of germ. This is the right molar of the lower jaw. The length of this tooth is 9·2 inches or ·234 metres, and the breadth measured on the base or lower bulge of the mamillæ 2·95 inches or ·074 metres; it consists of six pair of points or mamillæ, with apparently (as the fossil is slightly fractured at this point) a bilobed talon in the rear. The coronal surface is here shewn.

Fig. 3. An internal view of the same tooth.

Fig. 4. An external view of the same, exhibiting the obliquity of wear on the coronal surface.

Fig. 5 and 6. Fragment of a tooth of a greater age than the preceding.

Fig. 7 and 8. Fragment of tooth with jaw attached; this is a portion of the left molar of the lower jaw of an animal of the same age as that represented in *figs. 5 and 6*, distinctly shewing the cup-like cavities formed by the detrition and gradual junction of the mamillæ: the obliquity of wear towards the outer surface is here very distinctly marked.

Fig. 9 and 10. Fragment of a tooth of the same age as the preceding.

The three last specimens have belonged to animals of nearly the same age; the mamillæ are much worn, and we see the gradual obliteration of their independent hollows, reducing the coronal surface to the appearance exhibited in *figs. 11 and 12*.

Fig. 11. Shews the detrition at an intermediate state between *figs. 9 and 10*, and *fig. 12*. The posterior portion of this specimen still retains the encircling lines of enamel on the worn down points, whilst the portion in front has arrived at its last stage of wear.

Fig. 12. May be considered as a representation of the tooth in its final state of detrition, when all marks of the mamillated form of crown is obliterated, and nothing remains but an outer border of enamel encircling a deep internal hollow of ivory.

I wish to draw attention particularly to the alternating position of the mamillæ, which I consider to be the chief specific character, and which is distinctly marked throughout the whole series; and, referring

again to the Asti fossil as figured in CUVIER, I think that a clear identification is established.

As my object in writing this note is simply to point out the distinctive characters of the teeth of the mastodon à dents étroites, which have been found in the Siwálik hills, it is unnecessary to make any further remarks until we can enter upon a general description of the fossil mastodons and elephants of these hills; noting however, that from the half of a lower jaw of this species, with its ramus attached, which is now in my possession, we may look forward to some peculiarities of form, differing very materially not only from the fossil and existing elephant, but also from the other species of mastodons.

Up to this period I am only aware of the discovery of two species of mastodons in the Siwálik hills; namely, the *variety* of *M. angustidens* which is the subject of this note, and the *M. Elephantoides* of Clift. The former is very rare, and the latter in very great abundance.

IX.—*Meteorological Register kept at Bangalore. By Dr. J. MOUT, Medical Surgeon, 13th Dragoons.*

If the accompanying meteorological table, kept at Bangalore, for the year 1835, be of any interest, you are at liberty to make any use of it you please. It has been drawn up for the medical reports, which I am in the habit of transmitting to the heads of my department, and the transcription of which is all the trouble it now gives. The original table, as kept every two hours for the entire of 1834 and 1835, are also at your service; but they are two voluminous and bulky, I should think, for any useful purpose. The column of monthly average was obtained by adding the state of the thermometer, kept every two hours for the entire 24 hours; dividing this by 12, gave the average for each day. These added together for the month, and divided by the number of days in the month, give the monthly average noted in the table.

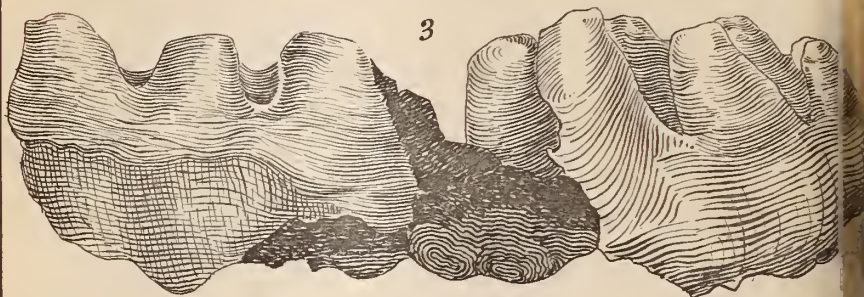
The wards of the hospital are visited by one of the medical pupils or apprentices every two hours from 10 P. M. to 4 A. M., whose duty it is to give medicine, &c. to the sick, and, at the same time, to mark the thermometer. The corporal of the guard, when relieving the sentries, is responsible, and sees this duty performed; and, in the day time, the hospital serjeant, apothecaries, pupils on duty, &c. mark it, the rest of the 24 hours; so that every source of error is endeavoured to be avoided. The thermometer marked S., or *side*, is fixed on the end of a shelf, some inches from the wall, and by its position, screened from the influence of the glare or reflected heat; the other, marked C. or *centre*, is suspended from the centre of the room, about seven feet from the floor, and the general agreement of the two instruments is a pretty good guarantee for their accuracy. The apartment is the surgery of the

Masto Mastodon Angustidens

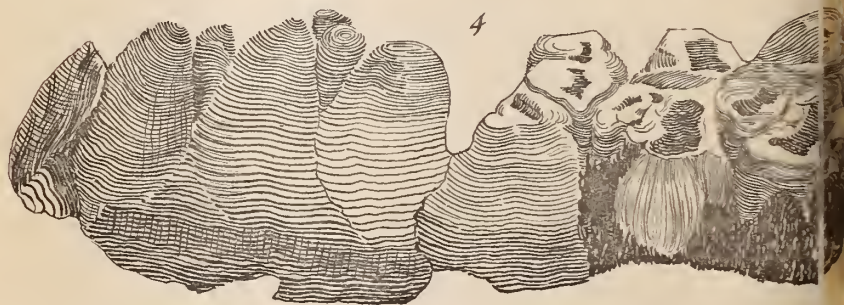
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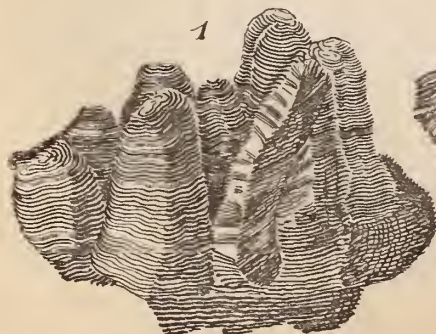
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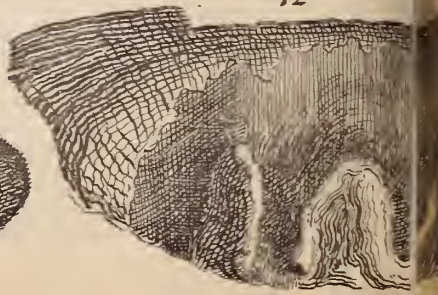
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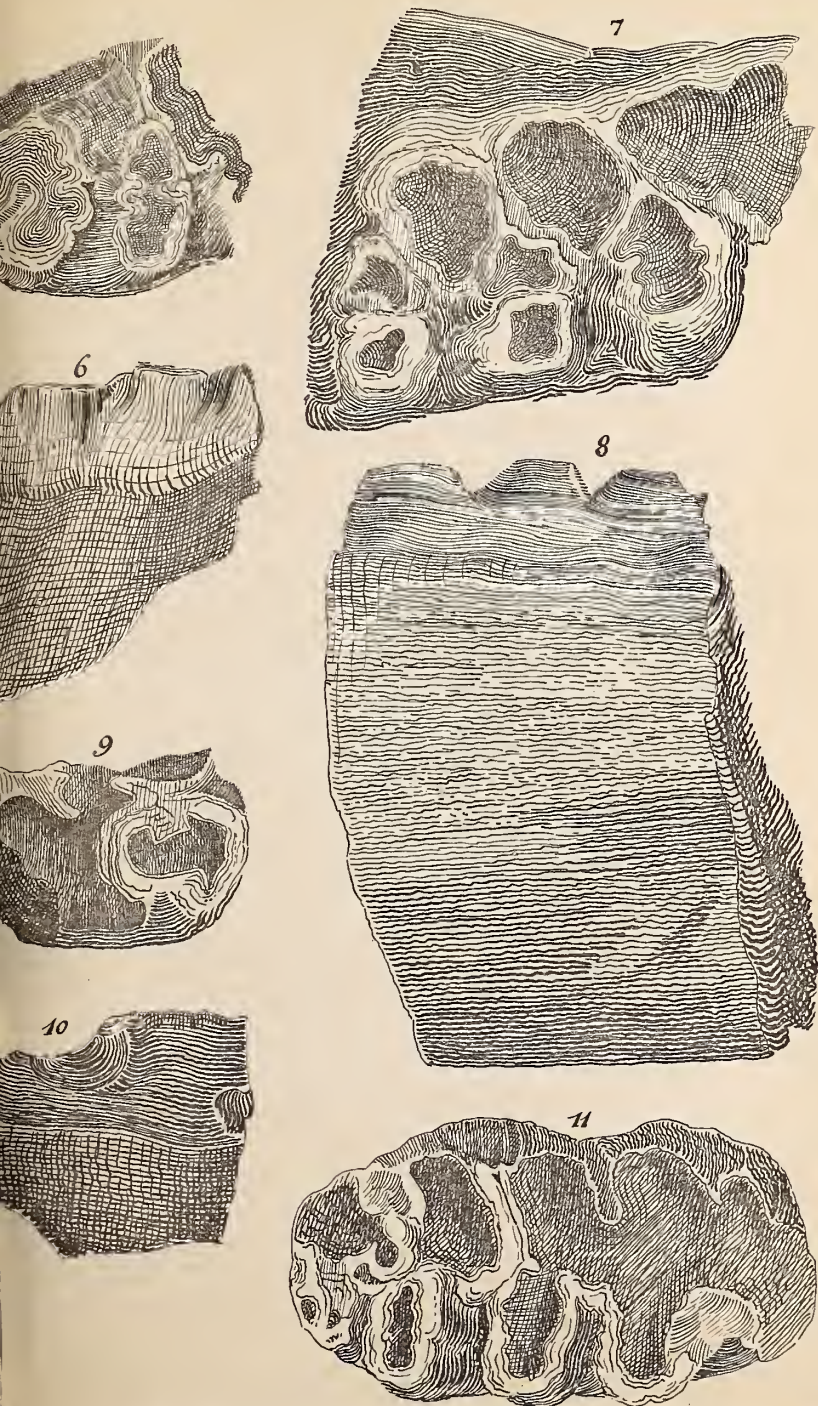
1



12



of the Siwalik hills.



hospital, 12 feet square, with a door facing the east and a window to the north. The former always, and the latter generally, kept open. There are also two small ventilators on the west side, always admitting a circulation of air.

The other table is from Sir. J. F. W. HERSCHEL'S suggestion of meteorological observations, &c. kept on four fixed days in each year* and the thermometer, &c. marked every hour.

Abstract of Two-hourly Meteorological Register, kept at Bangalore, 1835.

Months.	S. or Side. C. or Centre.	Monthly average of Ther., taken every 2 hours, day and night.	Average at 10 A. M., for the whole month.	Barometer.			Rain		Wind.	Remarks.
				Average highest.	Average lowest.	Monthly Mm. Av.	Inches.	Tenths.		
Jan.,	{ S. C.	70.74 71.58	69.50 70.25	27.10	27.00	27.05	...	...	Eas- terly.	Weather delightfully cool and bracing—some foggy mornings, and after the 24th, cloudy days.
Feb.,	{ S. C.	73.53 73.07	72.50 72.00	27.75	26.98	27.36	...	...	Eas- terly.	Weather cool and pleasant —sun getting powerful.
Marc.,	{ S. C.	79.58 79.79	78.75 80.50	26.95	26.88	26.91	..	35	Ey. or Sy.	Mornings cool, days hot, and at times close and oppressive—one shower of rain.
April,	{ S. C.	78.66 78.33	78.50 78.37	26.95	26.87	26.91	4	16	Ey. or S. E. th. Wy. & V.	Generally close, hot, and sultry—the air cool.
May,	{ S. C.	79.22 79.58	78.50 78.50	26.85	26.79	26.82	5	89	Wy. or S. W.	Weather cool and cloudy— some heavy showers of rain.
June,	{ S. C.	75.66 75.66	75.25 75.50	26.79	26.81	26.80	3	24	Wy.	Weather cool and pleasant, hazy or cloudy, with fre- quent showers, and some falls of rain.
July,	{ S. C.	74.45 74.64	73.75 73.00	26.75	26.78	26.76	5	88	Wy.	Weather cool and hazy, with heavy showers, and pleasant.
Aug.,	{ S. C.	73.45 74.00	73.25 73.50	26.78	26.42	26.60	4	13	Wy.	Weather cold and chilly, with constant showers, and some heavy falls of rain.
Sept.,	{ S. C.	74.00 74.00	73.75 73.25	26.82	26.77	26.84	13	97	Wy. th. V. and Ey.	Weather cool, clouded, and pleasant—several heavy showers of rain.
Oct.,	{ S. C.	70.38 71.71	70.50 71.50	26.84	26.78	26.81	5	10	Ey. & N. E. th. Wy. & V.	Weather cool and pleasant, with some heavy falls of rain.
Nov.,	{ S. C.	71.50 71.78	71.37 71.50	26.95	26.89	26.92	1	30	Ey. or N. E. & Wy.	Weather delightful, cold, bracing and generally cloudy, some foggy morn- ings, and at times very cold.
Dec.,	{ S. C.	69.93 70.19	69.25 69.75	26.96	26.90	26.93	...	...	N. E. & Ey.	Weather cold, bracing, and delightfully pleasant and invigorating.
Ann. Avg.,		74.39	73.85	26.95	26.82	26.89	44	02		

N. B. The Thermometers marked every two hours—the Barometer at 10 A. M. and 3 P. M.

* This daily register of the Barometer, at 10 A. M. and 4 P. M., would be particularly acceptable, provided the instrument was a good one, which we almost ear could not be the case. (See below.)—Ed.

X.—*Meteorological Observations, taken every hour, at Bangalore, in the Hospital of H. M. 13th Dragoons, from 6 A. M. of the 21st to 6 P. M. of the 22nd March, 1836, inclusive, in conformity with Sir W. Herschel's instructions. By the same.*

Hours of Observation.	Range of Barometer.	Range of 2 Therms.		Weather.
		Side.	Centre.	
March, 1836.				
6 A. M. 21st.	27,01	76	76	Weather clear, cool, and pleasant.
7 ditto,...	,01	77	77	Calm; the sun getting hot when exposed outside.
8 ditto,...	,01	78	78	Much the same; sun getting very hot ditto.
9 ditto,...	,01	80	81	Ditto ditto ditto; gentle breeze.
10 ditto,...	,01	81	84	Very hot; some light clouds; ditto.
11 ditto,...	,00	82	84	Sun hot, air cool, some light clouds, wind rising.
12 Noon, ..	,01	84	84	Sun at times obscured, light clouds, and the air cool and refreshing.
1 P. M.	,00	84	86	Ditto, ditto, ditto.
2 ditto,...	,00	84	88	Ditto, ditto, ditto.
3 ditto,...	,00	85	86	Sun very oppressive, very little wind, and very hot and close; some light clouds.
4 ditto,...	26,95	85	88	Very close; the sun very hot, scarcely any wind.
5 ditto,...	,95	84	86	Getting cool, wind rising, and very pleasant.
6 ditto,...	,95	84	86	Calm and pleasant; sky clear.
7 ditto,...	,95	84	86	Ditto and very close; light clouds; some lightning; S. E.
8 ditto,...	,95	83	84	Ditto gentle breeze ditto ditto.
9 ditto,...	,95	82	84	Gentle breeze; some heavy clouds; Wy. ditto.
10 ditto,...	,96	81	83	Calm and very sultry; some heavy clouds hovering about; some lightning; S. E.
11 ditto,...	,97	81	82	Slight breeze from S. E.; sky clearer, some lightning, N. W.
12 Midnight,	,97	80	79	Ditto, clear sky; frequent; ditto ditto.
1 A. M. 22d,	,98	80	78	Cool and pleasant; ditto; gentle breeze from S. E.
2 ditto,...	,98	80	78	Wind rising and strong from S. E.; at times variable; sky clear.
3 ditto,...	,98	80	79	Still strong breeze from S. E.; at times Wy. do. do.
4 ditto,...	,98	78	77	Gentle cool breezes ditto; cloudless sky.
5 ditto,...	27,00	80	78	Ditto ditto.
6 ditto,...	,00	78	78	Very gentle breeze; not so cool as at 5, but pleasant; ditto.
7 ditto,...	26,98	77	77	Clear and pretty cool; very calm, but the sun getting hot.
8 ditto,...	27,00	79	79	Ditto ditto, ditto ditto.
9 ditto,...	,00	80	81	Much the same, but the sun getting very hot, scarcely any breeze.
10 ditto,...	,00	81	83	Getting very hot, very calm and clear, slight breeze.
11 ditto,...	,00	82	85	Gentle breeze from N.; sky clear, sun hot, but not oppressive.
12 Noon. ..	,00	83	86	Calm and sultry; light clouds; sun getting very hot.
1 P. M.	,00	83	86	Sky clear and cloudless; slight breeze from N.; sun very hot.
2 ditto,...	,00	84	87	Ditto ditto, hot and sultry.
3 ditto,...	26,98	85	86	Ditto ditto, ditto ditto.
4 ditto,...	,95	85	87	Very sultry; little or no wind; sky clear.
5 ditto,...	,93	85	87	Ditto ditto ditto.
6 ditto,...	,93	84	87	Ditto ditto ditto.
Hourly Mean				
Average, ..	26,98	81.59	82.73	

N. B. The observations were made in an apartment 12 feet square. One thermometer hung in the centre, 7 feet from the floor; the other, at the end of a shelf, some inches from the wall, and quite protected from reflected heat.—The room has a door facing the east, and a small window to the north, both left open*.

* The march of the Barometer seems so sluggish that we fear the observer neglected to tap the tube previous to reading off—an indispensable precaution with ordinary instruments.—ED.

XI.—*Horary Observations taken at Dádúpur, in conformity with Sir John Herschel's Circular. By Col. COLVIN, Lieut. BAKER, and Lieut. DURAND, Engineers.*

[The original, whence we have with permission extracted these tables for publication, has been forwarded to the Secy. of the South African Phil. Inst.]

Barometrical Observations taken at Dádúpur, Sept. 1835.

Days.	Time.	Wet Bulb.	Ther- mometer.	Barometer, by Cary.		Mountain Barom. by Troughton.		Remarks.
				Attached Therm.	Barometer.	Attached Therm.	Barometer.	
	H	D.	D.	D.	Inch.	D.	Inch.	
20	18	73.	72.8	73.2	28.690	73.6	23.924	Calm. Mist cannot be seen through for 300 yards, appears less over head.
"	19	74.9	74.8	75.	695	75.	932	Ditto ditto clearing off a little, with just a breath of wind from east.
"	20	75.4	75.7	75.8	706	75.6	942	Ditto ditto ditto objects becoming visible 800 to 1000 yards off, air just perceptible E.
"	21	77.2	78.	78.4	727	78.	960	Wind S. W. light and variable, clear except light wreaths of mist along the horizon.
"	22	80.9	81.8	81.9	744	81.3	983	" ditto very light ditto, with light low transparent clouds, apparently the remains of the mist.
"	23	81.6	83.5	84.6	740	84.4	981	" W. light ditto, still a few light clouds.
"	24	81.6	84.6	85.3	728	84.2	963	" W. light and variable, ditto ditto ditto.
21	1	82.	85.8	86.3	704	85.7	934	" W. light breeze, ditto ditto ditto.
"	2	81.6	87.5	87.7	665	86.9	904	" W. ditto ditto ditto, except the line of mountains which is clouded.
"	3	80.4	87.2	87.7	636	87.2	872	" W. by N. ditto ditto ditto ditto ditto, N. to S. E. in white masses.
"	4	79.4	86.8	87.2	609	86.7	845	" N. W. ditto ditto ditto ditto ditto N. E. to S. E. ditto.
"	5	79.7	85.1	86.2	610	85.4	834	" Ditto ditto ditto ditto ditto ditto.
"	6	77.6	82.2	83.	711	82.4	810	" Ditto much fallen, ditto light clouds over the mountains and on the S. W. horizon.
"	7	77.	80.	80.8	626	80.2	823	" Ditto as before, ditto ditto ditto ditto.
"	8	75.2	78.2	79.	604	79.	829	" Ditto ditto ditto, stars bright.
"	9	75.5	77.7	78.5	605	78.2	849	" Ditto light ditto ditto.
"	10	75.	76.4	77.7	612	78.7	860	" Ditto breeze in gusts, ditto ditto.
"	11	73.3	75.	75.7	620	76.2	870	" Ditto ditto light ditto ditto.
"	12	73.2	74.2	75.	618	75.3	842	" Light air westerly ditto ditto.
"	13	72.	73.	73.5	609	74.2	832	" Ditto ditto ditto ditto.
"	14	70.7	71.7	72.5	615	73.	846	" Ditto ditto ditto ditto.
"	15	70.5	71.2	71.8	607	72.2	827	" Ditto ditto ditto ditto.
"	16	70.	70.8	71.2	607	71.5	829	" Ditto ditto ditto ditto.
"	17	70.	70.3	71.	622	71.2	840	" Ditto ditto ditto do dawn appearing.
"	18	69.3	69.7	70.4	620	70.6	848	" Calm, ditto mountains cloudless.
"	19	71.4	71.6	72.	637	72.	869	" Ditto ditto ditto.
"	20	75.2	76.5	76.5	663	75.8	890	" Ditto ditto, except light clouds over the mountains.
"	21	78.	80.	80.	678	79.2	907	" Ditto ditto ditto ditto N E. to S. E.
"	22	79.6	82.	82.3	690	81.5	916	" A very light air from E. ditto large white clouds on and behind the mountain range.
"	23	80.2	83.5	83.9	653	83.4	918	" Ditto " W. ditto ditto ditto ditto.
"	24	80.4	85.2	85.5	674	84.5	903	" Ditto " W. ditto masses of ditto ditto ditto N. by E. to S. E.
22	1	81.	87.	87.1	647	86.5	872	" N. W. light breeze, ditto ditto ditto.
"	2	80.8	87.3	87.8	605	87.5	859	" Ditto ditto ditto ditto ditto ditto.
"	3	81.2	88.1	88.5	584	87.7	823	" Ditto in gusts ditto ditto ditto ditto.
"	4	80.8	87.8	88.4	573	87.7	795	" ditto ditto ditto ditto ditto ditto ditto.
"	5	79.8	86.	87.	572	86.3	790	" W. ditto ditto ditto, mountains clear to N. cloudy to E. and S. E.
"	6	79.	82.6	84.2	568	83.5	786	" W. light ditto ditto ditto ditto.

Observation commenced at 6.0.30. A. M. of 21st September, common reckoning.

Barometrical Observations taken at Dádúpur, March, 1836.

Day.	Time.	Wet. Bulb.		Detached Thermo- meter.	Barometer, by Cary.		Mountain Bar. by Troughton.		Remarks.
		H.	D.		Attached Therm.	Barom.	Attached Therm.	Barom.	
				D.	D.	Inch.	D.	Inch.	
20	22	65	3	71	70	28	70	29	Wind E.
"	23	67		71	73	28	72	29	Wind E. sky clear, over head light clouds
"	24	69		75	75	28	75	29	to South, Sirmnr mountains clouded.
"									Wind E. light clouds over mountains ex-
"									cepting the sub-Himálayas, which are
"									visible.
21	1	70	7	77	78	95	77	08	Ditto ditto ditto ditto.
"	2	70	2	77	78	92	78	05	Wind S. E. light but steady clouds in di-
"									rection of mountains cover more of the
"									sky.
"	3	67	0	75	75	91	74	02	Wind E. Gusty, clear over head, light
"									clouds all round the horizon.
"	4	66	2	74	75	91	74	03	Wind N. by E. unsteady, clear over head,
"									cloudy from N. W. to N. E. outline of
"									mountains visible.
"	5	64		71	72	90	71	02	Wind N. by E. unsteady, clear to S. W.
"									Elsewhere clouded, stormy appearance
"									to north.
"	6	64	8	71	71	90	70	02	Wind N. light. Clear to S. W. Elsewhere
"									light clouds, outline of hills visible.
"	7	62	2	66	67	89	66	01	Ditto ditto ditto ditto ditto.
"	8	60	4	63	64	89	64	00	Ditto ditto ditto ditto ditto.
"	9	59		60	62	90	61	02	Wind S. E. night clear.
"	10	58	5	60	61	89	61	03	Ditto very light, night clear.
"	11	57		58	59	89	59	01	Clear. Clear star light.
"	12	56	2	57	58	88	59	01	Ditto ditto.
"	13	54	5	55	57	88	56	00	Wind N. very light, clear star light.
"	14	53	5	54	55	86	55	28	Ditto ditto ditto.
"	15	53		53	54	85	55	98	Ditto ditto ditto.
"	16	52	5	52	55	85	53	98	Ditto ditto ditto.
"	17	51		51	52	85	52	98	Wind N. brisk, clear star light. Dawn
"									commencing.
"	18	49	3	49	51	86	51	29	Wind N. light, sky clear.
"	19	49	5	50	51	88	50	02	N. by E. ditto ditto.
"	20	58	2	55	55	91	54	05	Ditto ditto ditto.
"	21	59		63	62	94	61	09	Ditto ditto ditto.
"	22	62	2	68	67	96	66	11	Ditto ditto ditto.
"	23	61	7	70	71	97	70	11	Calm, sky clear.
"	24	66	5	73	74	95	73	09	Wind S. E. light, sky clear.
"	25	68	8	76	76	94	75	07	Ditto ditto ditto.
"	26	68	5	76	76	92	76	03	Calm, sky clear.
"	27	69	7	78	78	90	77	02	Wind S. W. light, sky clear, except light
"									clouds over the mountains.
"	28	69	7	78	78	86	78	00	Wind W. light ditto ditto ditto.
"	29	69	5	77	78	86	77	28	Ditto ditto ditto ditto.
"	30	70		76	76	86	76	99	Ditto ditto ditto ditto.

Time ascertained by one observation of equal altitudes. Observation commenced at 10h. 21m. 31s. of 21st March, common reckoning, and was continued at exact intervals of one hour. (For convenience the minutes and seconds have been omitted in the table.—Ed.)

Memoranda relative to the above Table of Barometrical observations for September 1835. By Lieut. DURAND.

Instruments employed.—Colonel COLVIN's Barometer was made by CARY. The cistern is of ivory, the Instrument is adjusted for observation by bringing the surface of the mercury to a level with the slit in the socket of the stopcock of the cistern, by means of a brass screw at the bottom of the cistern. This instrument was, when compared with the standard Barometer in Calcutta, by J. PRINSEP, Esq., found to be correct.

Lieut. DURAND's Barometer is one of TROUGHTON and SIMM's mountain Barometers. When compared with the standard Barometer, it stood 0.043 too low.

In order to determine the amount of change which the two instruments might have suffered, relatively to each other, in consequence of the journey from Calcutta, a comparison was instituted between the heights shown by the two Barometers, during the month of June 1835; the following is the result.

Mean. Height of Bar.	Attd. Ther.	Detd. Ther.	Moist Bulb.	Time.	Mean of the foregoing.				
28.744	90.4	89.51	83.15	10 A. M.	28.6944	92.92	91.83	84.145	CARY's Barometer.
28.6488	95.44	94.25	85.14	4 P. M.					
28.7496	87.83	86.51	83.22	10 A. M.	28.7035	88.616	87.236	83.	TROUGHTON and SIMM's Barometer.
28.6585	89.4	87.96	82.79	4 P. M.					

Whence may be deduced, that CARY's barometer suffered considerable derangement from the inevitable jolting, &c. attendant on so long a journey. TROUGHTON's had evidently been less disordered, probably but little so; without a second comparison with the standard barometer, however, the comparative accuracy of TROUGHTON's rests upon supposition.

Previous to the day on which the hourly observations were to commence, CARY's Barometer was accidentally put out of order, and it became requisite to re-fill the tube with mercury; this was accordingly effected, but the means for safely heating the filled tube not being at hand, and the tube appearing to the eye free from air, it was inserted into the instrument; the observations show the great difference which this untimely accident caused in the heights of the two mercurial columns.

Thermometers.—The attached thermometers of both barometers read off to degrees.

The thermometer employed as a moist bulb, is one made by TROUGHTON and SIMMS. When compared in Calcutta it stood 1.3 too high; the scale is graduated to degrees.

The detached thermometer also by TROUGHTON and SIMMS, reads off only to two degree divisions; when examined in Calcutta it was found to be 0.4 too high.

From the foregoing remarks on the thermometers, it is evident that the division of the scales of these instruments did not admit any perfect accuracy in reading off the decimal parts of a degree: the decimal parts in the table are therefore only careful approximations, and under particular circumstances, such as reading off at night, &c. small inaccuracies must have been unavoidable.

Time.—The time of apparent noon and the rate of chronometer were ascertained by a series of observations of equal altitudes of the sun, on the 17th, 18th, 19th and 20th September.

Location of Instruments.—The instruments were placed in a verandah facing the north, perfectly shaded, and sheltered from the wind, without, at the same time, hindering a free circulation of air. CARY's Barometer stood about 4ft. 6, from the wall; TROUGHTON's about 1ft. 6, from the wall, the space partitioned off and allotted to the instruments not admitting their further removal from the northern front of the building.

Place of Observation.—Dádúpur is situated on the right bank of the Jamna, a little below the junction of the Sombe: the position of the Canal

Department depot is somewhat north of the village, and is in latitude $30^{\circ} 12' N.$ and about longitude $77^{\circ} 23' 45'' E.$ as deduced from an observation of the transit of mercury on the 5th May, 1832. The range of low mountains separated from the more lofty and older formations by the Kyadur Doon is about 20 miles from Dádúpur. The word mountains which enters amongst the remarks on the particulars of the weather, must be understood to allude to the distant ranges of the Himálayas, and not to the low and neighbouring mountains.

It is necessary to add, that the hourly observations were taken by Colonel COLVIN, Engrs., Lieut. BAKER, Engrs., and Lieut. DURAND, Engrs.

Dádúpur, Nov. 24th, 1835.

The same remarks are applicable to the March observations, CARY's Barometer not having been yet boiled; the site of the instruments was changed, being now under a thatch erected for them in a free circulation of air.

XII.—*Proceedings of the Asiatic Society.*

Wednesday evening, the 1st June, 1836.

W. H. MACNAGHTEN, Esq. Vice-President, in the chair.

Messrs. W. BRUCE and R. W. G. FRITH, proposed at the last meeting, were ballotted for, and elected members of the Society.

Dr. LUMQUA, proposed at the last meeting, was, upon the recommendation of the Committee of Papers, elected an honorary member.

The Rev. R. EVEREST, requested his name to be withdrawn from the list of members.

Captain W. FOLEY regretted, that private circumstances obliged him also to retire from the Society.

Read letters from Colonel J. COLVIN, Engineers, Colonel CAULFIELD, and Colonel STACY, acknowledging their election as members of the Society.

Read letters from NICHOLAS CARLISLE, Esq. Secretary to the Antiquarian Society of London, and J. FORSHALL, Esq. Secretary to the British Museum, acknowledging the receipt of copies of the Index, &c.

Read a letter from Captain H. HARKNESS, Secretary to the Oriental Translation Committee of the Royal Asiatic Society, stating, that arrears of the Society's subscription were due, to the amount of £31 10s. from 1833 to 1835, inclusive.

Ordered, that the arrears be paid up, with an apology for the delay.

The Secretary stated, that upon an application from himself on the part of the Society, the Government had been pleased to grant exemption from postage on all certified "*proof sheets*," addressed by him to authors or editors for correction, as well as on their return, similarly attested to his address. The Government was also willing to grant exemption from duty on objects of Natural History or Curiosity, imported for or exported from the museum; application to be made in each particular case.

Library.

Read a letter from Captain R. B. PEMBERTON, forwarding a copy of his report on the eastern frontier of British India, with an appendix and maps, for presentation to the Society.

Also, from Dr. McCLELLAND, a copy of his work entitled "*Inquiries in Kemaon*," Statistical and Geological.

Read a letter from JAMES R. EWART, Esq. forwarding on behalf of Captain J. JERVIS, a copy of his publication on Indian Meteorology.

Die Philosophie der Hindu Vaedanta Sara von Sadananda des Ram Krishna Tirtha von Dr. OTHMAR FRANK—*presented by the author.*

Ueber das Bild des Welthaumeisters, Visvakarma, von OTHMAR FRANK—*presented by the author.*

The Indian Journal of Medical Science, No. 61, June 1836—by Dr. Corbyn the Editor.

The following books were received from the booksellers :

LARDNER'S Cabinet Cyclopaedia, SWAINSON'S quadrupeds.

_____, Greece, Vol. 2nd.

_____, Rome, Vol. 2nd.

Illustrations of the Botany and other branches of the Natural History of the Himálaya mountains, by J. F. ROYLE, Esq. F. L. S. and G. S. and M. A. S., parts 7th and 8th.

Museum.

Four gold and silver fish, from Nipál, were presented by HARI' DA's, Mahant of Patna.

A drawing, supposed to be of the Allahabad láth ; as it stood when perfect, was received with a note from Dr. MOUAT, H. M. 13th Dragoons at Bangalore.

This drawing accords more exactly with the láth in Tirhut, for which it was doubtless intended, (See Vol. IV. page 122.)

Literary.

A paper on the valley of Cashmir, by the Baron HUGEL, was read.

The author's detention at Bombay has enabled him to communicate at greater length the observations made during his recent visit to the valley. The Society is much beholden to this illustrious traveller for thus disinterestedly placing at its disposal the results of his personal labours, notwithstanding he has doubtless the intention of publishing himself on his return to his own country.

The latitude of *Kashmir* town (*Srinagar*) is $34^{\circ} 22' 58''$ and (if Vizirabad is correctly laid down in ELPHINSTONE'S map), its longitude is $75^{\circ} 12' 30''$ by cross-bearings taken by the Baron from the latter place to the *Pirpanjabl* pass, the bearing of which was also taken at *Kashmir* town.

In most maps the situation of this place is $34^{\circ} 40'$ lat. and $75^{\circ} 58'$ long :—in HAMILTON $33^{\circ} 23'$ lat. $74^{\circ} 47'$ long. : and in H. T. PRINSEP'S *RANJEET SINGH*, derived from Capt. MURRAY'S information, $34^{\circ} 9'$ and $75^{\circ} 32'$ respectively*.

A paper by Mr. AVDALL, entitled "A Memoir of a Hindu colony in ancient Armenia," was submitted.

[This will be printed in our next.]

An attempt to fix the epochs of the four principal Buddhas, by Captain FORBES, of Ceylon, was presented.

Mr. CSOMA'S translation of the Bhotian Banner Inscription, presented at the meeting of March, was read.

[Printed in the present number.]

Facsimile of inscription on the Bhittree láth near Gházipur, was presented by Lieut. A. CUNNINGHAM, together with a drawing of the pillar.

A memoir on the geography of *Peucelaotis*, and elucidations of ALEXANDER'S march, together with drawings of all the coins and relics discovered by himself, and a map of the country from his own surveys, intended for presentation to M. JACQUET of the Paris Asiatic Society, was obligingly entrusted by the author M. COURT, of Maharája *RANJIT SINGH*'S service, to the Secretary, for free communication to the Society of such information as they may think worthy of extraction.

Physical.

Extract of a letter from the Baron HUGEL to the Society, was read, announcing the important discovery of a bed of fossil bones in *Perim* island, in the gulph of Cambay.

[Printed in the present number.]

* In the note on *Kashmir* published in the March No. p. 185, we asserted the latitude to be $34^{\circ} 35'$ with meridional (double) altitude, $72^{\circ} 4'$.—We supposed the latter corrected to the Sun's centre ; as that was not the case, $15'$ must be deducted, while $3'$ must be added for difference of declination from Greenwich—making the latitude as above, $34^{\circ} 23'$.—ED.

Specimens of lignite and fossil wood from Nipál, were presented on the part of Subadar JODA SINGH.

Specimens of quartz fossil wood and shells from Van Dieman's Land, presented by C. K. ROBISON, Esq.

A note on the teeth of the *Mastodon angustidens* of the Siwálik hills, was received by Captain CAUTLEY.

Also, by Dr. FALCONER and Capt. CAUTLEY, a memoir on the *Felis Cris-tata*, a new fossil tiger from the Siwalik hills.

A skeleton of a tortoise (*CAREY'S Kuchuya*), presented by Mr. J. T. PEARSON.

Specimens of the Indian Barbet, (*Bucco Indicus*,) Woodpecker, (*Picus Mucci*,) and smaller green pigeon, (*Vinago Vernaus*,) presented by Lieut. C. MONTRIOU, Ind. Navy.

A specimen of the wandering Albatros, (*Diomedea exulans*,) presented by J. CHILD, Esq.

A specimen of the Bald Ibis, (*Ibis calva*,) presented by Dr. A. CAMPBELL.

Skulls of the tiger, (*Felis Tigris*,) Leopard, (*F. Leopardus*,) long-lipped bear, (*Ursus labiatus*,) and Gurriyal, (*Garialis Gangeticus*,) presented by Dr. McCOSH.

A specimen of the ornamented snake, (*Coluber Ornata*,) presented by Mr. KYD.

A specimen of *Gecko vittatus* (var.) by Dr. A. JACKSON.

XIII.—Address read before the Bombay Branch of the Royal Asiatic Society, on the 27th January, 1836. By the Rev. JOHN WILSON, President.

[This address, obligingly communicated to us by the author, gives so valuable a review of all that has been done by the Bombay Society, that we make no apology, but rather feel a pride in transferring it to our pages entire: the rather because Bombay does not yet boast a Journal of its own, like Madras does. Since the establishment of the latter journal, we have discontinued inserting the Proceedings of the Society at that Presidency, conceiving the means for their preservation and circulation to be more appropriately provided for.—ED.]

This Society has now been in existence for upwards of thirty years; and it may not be improper for us, in our present circumstances, briefly to advert to its past proceedings, and to some of the various subjects of inquiry, and especially those connected with our situation in western India, which still invite our attention.

In the discourse delivered at the formation of the institution, by its first President Sir JAMES MACKINTOSH, that great man declared himself "ambitious of no higher office than that of conveying to India the desires and wants of the learned at home." A more worthy "representative of the curiosity of Europe," could not have presented himself in this country. It must be admitted, however, that, powerful as was his influence, and remarkable as has been the zeal and success of the members in prosecuting some of the objects proper for investigation by an Asiatic Society, their contributions on the topics to which he more particularly directed attention, have not been so numerous and extensive as might have been reasonably expected.

On Natural History, on which he dwells at greatest length, there are in our Transactions only a few distinct contributions, while the subject is only partially adverted to in the papers descriptive of particular districts of the country. This is undoubtedly a matter of regret, for the

study, directly conversant as it is with the works of God, and with the intimations which they give of His wisdom, power, and goodness, is, in all circumstances, possessed of the highest interest, and conduces both to intellectual gratification and to moral improvement; and in such a country as India, so vast in its extent, and so grand and multifarious in its productions, it is possessed of peculiar charms. It is a study, in many of its branches, so intimately connected with national resources, and the useful arts, and the means of humane amelioration, that it is powerfully recommended to every economist and philanthropist. It is a study in which most who have received a liberal education may engage, and to advance which, all who give it an ordinary share of attention, may considerably contribute. The sojourners in Bombay have, in the mountains, forests, and islands, in the neighbourhood, innumerable objects, connected especially with Geology, Botany, and Zoology, which both from their comparative novelty, and intrinsic interest invite attention. The Society cannot do better than encourage their investigation, and imitate in reference to them, the laudable procedure of the sister institution in Bengal, with regard to those of a similar nature more particularly connected with that province, and among whose highest honours must ever be, its having numbered among its members such men as ROXBURGH and WALDICH, and fostered their earliest attempts to unfold the beauties and mysteries of creation. The report of observation and discovery connected with them, if given in this place, would form an agreeable entertainment even to those who may be most ardent and persevering in their researches into the other important objects of the Society's investigation. That a studious attention to both of them, by individuals, is not impracticable, is well evinced in the cases of JONES, and COLEBROOKE, and CAREY, and others, who have been distinguished in India both for their science and literature; and who have been not less remarkable for their knowledge and expositions of the thought and feeling of man, as connected with the objects of his devout regard, or superstitious reverence, and the language by which he holds communion with his fellows, than for their lively cognizance, and philosophic interpretation, of the varied phenomena of nature.

The Statistics of any country are intimately connected with its Political Economy, and are consequently highly worthy of attention. Their importance was not so generally admitted, as at present, on the formation of our Society; but it is strikingly set forth by Sir JAMES MACKINTOSH. The tables which he himself presented, connected with the population of Bombay, and the remarks with which he accompanied them, are valuable. Similar ones, of a later date, are desiderata, and when compared with those given by him, would furnish curious information. The Notices of Jambusar and Loni, given in our Transactions, by Drs. MARSHALL and COATES; and of certain districts of the southern Maratha Country, and of the *Jharejas*, of *Kach*, in the Journal of the home Society, by Dr. BIRD, and Lieutenant BURNES, are good specimens of what is required of other localities and tribes. Without the assistance of our liberal Government, little can be done with satisfaction in this department. Such assistance, by instituting special inquiries, and by delivering up documents already in its possession, or which could be procured by application to its judges, and magistrates, and revenue officers, it could easily, and with great advantage to itself, render*.

Only one paper on the subject of Political Economy, as connected with

* A proposition has, I understand, been made, by an able and zealous officer of this Presidency (Capt. T. B. JERVIS) to the different Governments of India, relative to the periodical publication of the returns of population, revenue, and cultivated and waste lands.

India, has been laid before our Society. It is by Mr. BRUCE, and has been transmitted to England, where it will not fail to be appreciated.

Of all the topics of inquiry meriting attention, that of the History and Present Condition of the People, in the different provinces, in regard to language, religion, literature, science and art, means of support, and manners and customs, is paramount. It is very extensive; and has met, from the members of the Society, with considerable attention.

The *Parsis*, the great body of whom dwell amongst us, present themselves as special objects of inquiry. The history of their original country, has been ably unfolded by Sir JOHN MALCOLM; and on its ancient chronology previous to the conquest by ALEXANDER, and its state from the battle of Arbela in A. C. 331, to the rise of ARDESHIR BABEGAN, much light has been cast by our late learned President, Colonel VANS KENNEDY. Mr. ERSKINE's papers respecting them, are remarkably interesting, as containing an able review, and analysis, of the Works of ANQUETIL DU PERRON, who followed Dr. HYDE as the expositor of their tenets; the results of his own observation; and valuable disquisitions on their sacred books and ancient languages. The researches of Professor RASK, in his paper given to this Society, whatever may be the opinions formed of the particular conclusions at which he has arrived, and it must be admitted he has reasoned ingeniously in their support, are also interesting. For the original tracts, with remarks, in the course of being published in France by M. MOHL, we owe our gratitude. The History of the Early Kings of Persia by MIRKHOND, translated by Mr. SHEA; and the History of Vartan and the Armenians, by Mr. NEUMANN; and of the Shah Namah, by Mr. ATKINSON, for which we are indebted to the Oriental Translation Fund, contain much historical information on the religion of ZOROASTER. Still more may be expected from the translation of that singularly curious work, the Dabistan, which is about to appear. The curiosity of the public respecting the Parsis, however, is far from being satisfied, as is evident from the inquiries which frequently reach this place both from London and Paris. We need a more exact translation of the books which they esteem sacred, than that which is furnished by ANQUETIL DU PERRON. Such a translation has been promised by Professor BURNOFF, whose attainments in oriental literature, and ardour in oriental study, afford good ground for hope that our wishes respecting it will be realized. Should he fail, the attempt may be made in Bombay, where there are still a very few Zand scholars among the Zoroastrians to be found, and whose assistance, as well as that to be furnished by the translations into Gujurathi, may be procured*. We require information particularly on their popular superstitions, and domestic manners and customs, and general habits, as exhibited to the native community, and which, there is reason to believe, differ not a little from those generally observed by their European acquaintances, and for which they have received, in the opinion of the most intelligent of their own number, a more than *quantum sufficit* of credit. It was with the view of adding my mite to the information possessed on these topics, and not because I conceived it possessed of any intrinsic merit, that I lately presented the Society with a translation of their General SROZE. There are extant narratives of their settlement and history in India, versions of which should be presented to the Oriental Translation Fund. At a late meeting of the Committee of Correspondence of the Royal Asiatic Society, some of the more liberal natives in Bombay, were invited to form themselves into an association, with the view of aiding in collecting information on some of the topics to which I have now adverted. Little, I fear, can be expected from them, without the co-operation of

* Six Fargards of the Vandidad can also be procured in Sanskrita.

European scholars, or without the proposal to them of special queries calculated to direct them in their communications. I am decidedly of opinion that it would be of advantage to both parties, were some of them associated with ourselves; and I would fondly hope that should any of them, possessed of competent attainments and zeal, and a respectable character and influence, ask membership of our body, it should be readily accorded.

There is no institution which has furnished more able and interesting illustrations connected with the Musalmáns than our Society. The question, so interesting in the history of the errors of the human mind, Was MUHAMMAD an impostor or an enthusiast, has been discussed by our late President Colonel VANS KENNEDY; and though many may dissent, as I myself do, from the conclusion at which he arrives, the ingenuity with which he conducts his argument, and the varied learning which he displays must be readily acknowledged. The same distinguished orientalist has furnished us with the most correct estimate of the literature of the Musalmáns in Persia, which is extant; and has given us a minute and precise abstract of the Muhammadan Municipal Law, with a constant reference to acknowledged authorities, and with an arrangement particularly luminous, being suggested by that of BLACKSTONE in his Commentaries on the Laws of England. His paper furnishes an important aid to the understanding of the state of Government, and society in general, in Muhammadan countries. The points at issue between the *Shias* and *Sunnis*, and which have been, and still are, the cause of the greatest distractions and animosities among the Moslems, are well illustrated by the translations and remarks of Sir JOHN MALCOLM; and the sentiments of the *Sufis* and *Mehdivis*, by those of the late Lieutenant GRAHAM and Colonel MILES. The account of the AKHLAK-I-NASIRI, by Lieutenant FRISSELL, and the translation of one of the discourses of SADI by Mr. ROSS, throw much light on the Musalmán Economics and Ethics, both theoretical and practical. What we chiefly want in reference to the Muhammadan religion, is a fuller account, drawn from a comparison of all the existing authorities, of the state of Arabia at the time of its origin, and from which we could form a more enlightened judgment than we do, of those great revolutions brought about by its author; of the history of its religious influence, distinguished as much as possible from that of the military exploits and civil arrangements of its followers, which have hitherto almost altogether engrossed attention; of the general arguments by which its doctors have urged its pretensions in opposition to Christianity*; of the Bohorast

* Some interesting information on this subject, is to be found in the *Controversial Tracts*, by the Rev. Henry MARTYN, and his opponents in Persia, and the preface prefixed to them by Professor LEE, and in the last of the letters addressed to me, by H'AJI' MAHAMMAD H'ASHIM, and published in Bombay. As the discussion of the points at issue, however, is an ancient one, it seems desirable that a collection should be made of the hints respecting it which are to be found in the Musalmán works of theology.

† To any person, whose leisure may permit inquiry into this body of Musalmáns, the following memorandum written by me on a visit to Surat in the beginning of last year, may not be unacceptable. "The Bohoras of Surat are divided into three sects, respectively denominated Ali, Sulimán, and Dáud. In the first of these, there are only five or six families; in the second, about fifty; and in the third, about five thousand, with a population of about twelve thousand. They have accounts of their tribe, one of which I have seen in Arabic, which carry back their history about six or seven hundred years. They generally support themselves by the vending and manufacture of cloths, hardware, household furniture, &c. They profess to be quite distinct from the agricultural Bohoras, who are to be found in the Baroch districts, and of whom a considerable number of families have now also settled in Surat.

"The Bohoras are under the religious, and, to a great extent, the civil government of a Mullá, whose head quarters were originally in Arabia. The Mullá in

and other curious sectaries; and of the peculiar practices, superinduced probably by intercourse with the Hindus, of those who profess it in India, and particularly in the provinces with which we are most intimately connected. That the latter subject is not unworthy of interest, will appear to any reader of the work lately published by Dr. HERKLOTS, and to the notices given of certain festivals by M. GARCIN DE TASSY. From these documents, as well as from Colonel KENNEDY's paper on the religion introduced into India by the Emperor AKBAR, it appears that the followers of Muhammad, cannot only, when circumstances tempt them, lay aside their intolerance, but accommodate themselves to existing prejudices, and indulge in the boldest speculations. In the almost universal neglect of historical records by the subjugated Hindus, we must principally look to the Musalmáns for any historical information connected with this country which refers to the times which intervene between the commencement of their conquest, and that of the European powers. The History by FERISHTA, translated by Colonel BRIGGS, though neither, as was to be expected, very philosophical nor rigid, is valuable. Captain ROWLANDSON and Dr. BIRD, have done well to translate two works which treat of the history of Malabar and Gujerat. They contain much interesting information. Another history of the latter province, by a very intelligent Bráhmañ, but principally from Muhammadan authorities, and which may prove worthy of translation, was lately presented to our Society by our zealous Secretary. There are materials to be found, in different places, sufficient to throw light upon the principal occurrences in almost every province of India.

Of various tribes of the Hindus, as the Katis, the Bhíls, the Banjaris, the Pandu Kolis, the Dakhan Kunbis, and the Karadi Bráhmans, and the inhabitants of *Sindh*, very curious notices are to be found in our Transactions. Of many other tribes, accounts have appeared in separate publications*. Many more, however, with marked natural peculiarities, and in a strange social state, still remain to be described. Those who

Surat sits upon a throne, and is highly respected. He is thrice saluted by every person when he is *in cathedra*; and his attendants give him all the attentions which the princes of the land receive when they are in *Darbár*. He has deputies in all the towns in India where Bohoras are to be found, and even in Maskat, Basora, Jadda, and Mokha. He has a very large income, arising principally from donations at births, marriages, and deaths; but from his funds, the poor of the sect, whether resident in Surat or occasional visitors, are supplied. He nominates his successor, having a principal regard to his talents, information, and capacity to govern.

"The Mullá, or Mulláji as he is called by way of distinction, reads the Korán, and addresses the people during five or six days of the Moharram, and one day during the month of Ramazán, when his auditors are numerous. In the part of Surat principally inhabited by Bohorás, there are many courts, in each of which there is a Mullá to conduct worship early in the morning. The people, however, seem most to relish praying at the tombs, or great mausoleums, which contain the sepulchres of some of the ancient Mullás and their relatives. They actually, as we observed, kiss the chunam covering of the graves!

"In regard to marriage, it may be observed, that the number of wives permitted by the Korán is allowed, as in the case of other sects of Musalmáns. The follies of the Hindus have found a place among them, in the manner in which marriages are contracted and celebrated. Girls are espoused at the early age of five years, and without much regard, on the part of their parents, to the age of those with whom they are united. The processions, and feastings, are conducted much as among the other classes of the natives.

"The shaving off the hair, which is viewed as a kind of sacrament, is performed on the 7th or 21st day after the birth, either of a son or daughter.

"Expulsion from caste follows the practice of gross immoralities, and particularly the drinking of ardent spirits.

"Funerals are conducted with considerable solemnity. Those of the higher classes are attended by the Mullá."

* Among the fullest, and most interesting of these, is the History of the Rámóshis, lately published by Captain MACKINTOSH.

are found resident in the jungles, and in mountainous districts, and who are probably the remains of the Aborigines of the country, are particularly worthy of investigation. Attention to them is called for, by all who desire to advance their civilization, and to elevate them from their present degradation. Description must precede any considerable efforts made for their improvement. Perhaps some similarities may be discovered in their language, religion, and customs, which may lead to important conjectures as to the ancient history of India. Of many of them it has been already ascertained, that they have had no connexion with Bráhmaism, except in so far as they may have felt its unhallowed influence in excluding them from the common privileges of humanity, and banishing them to the wilds, or dooming them to ignorance, and unwilling and unrewarded servitude*.

Though on the Hindu religion and literature in general, our publications contain rather scanty observations, some of our members have added greatly to the information communicated by the distinguished literati of the other side of India, and of Europe. Our Society was the first body to submit to the public a proposal for a union for the promotion of translations from the Sanskrita. Its claim to this honour, it is right again to re-assert. It will be established by a reference to a letter addressed to the Asiatic Society of Bengal, in 1806, by Sir JAMES MACKINTOSH, and published as an appendix to the first volume of our Transactions†. Such translations were practically encouraged by the Society itself, in the case of the *Liláwati*, a treatise on Arithmetic and Geometry by BHASKARA ACHARA, and the *Prabodh Chandrodaya*, a curious allegorical play illustrative of the opinions of the Vedantikas, and both published by the late Dr. JOHN TAYLOR. The first general account, of any considerable size, of the Hindu Pantheon, is by one of our members, Major EDWARD MOOR. In Colonel KENNEDY'S *Ancient and Hindu Mythology*, we have a work, than which none more important, if we refer either to original quotations from the *Shástras*, or learned disquisitions, has yet appeared. I make this remark with the more freedom, that circumstances called me, on the publication of the work, to animadvert on the estimate which it forms of the moral character of Bráhmaism in a manner which gave the learned author offence. In the *Essay on the Vedanta* by the same gentleman, we have the best account of that very curious system of speculation, considered in a philosophical point of view, which has yet appeared,—an account which proves it to be a system of spiritual pantheism, and as such entirely different, except in occasional expression, from that of the Mystics of Europe, to which it had been maintained to be similar by Sir WILLIAM JONES, and other writers‡. It was in this place that the first defence, by a Native, of both the exoteric and esoteric systems of Hinduism, in reply to those who seek to propagate the principles of our Holy Faith, appeared; and it was here that a rejoinder, embracing briefly the consideration of

* See particularly Mr. BABER'S Answers to the Queries of a Committee of the House of Lords on the state of Slavery in the South West of India.

† Page 310.

‡ In the works of the Mystics, and of the pious writers, to whom Sir WILLIAM JONES alludes in the course of his reasonings, there are figures of speech, and other expressions, very similar to those used by the Vedantists. Others, still more strikingly similar, could easily be produced. I give one from the Poems of RICHARD BAXTER.

“ But O ! how wisely hast thou made the twist !
To love thee and myself do well consist.
Love is the closure of connaturals ;
The soul's return to its originals :
As every brook is toward the ocean bent :
And all things to their proper element :
And as the inclination of the sight,
How small soever is unto the light :

both these subjects, was published. About two years ago, a portion of the *Rigveda*, the most considerable which has yet been printed, was published in *Sanskrita*, *Marathi*, and *English*, by one of our members. A translation of the whole of this work, to which I believe Prof. H. H. WILSON has turned his attention, and of the *Bhagawata Purána*, which, though it cannot claim an antiquity much exceeding that of six hundred years, is certainly the greatest practical authority at present, at least in the West of India, are greatly to be desired. On the different sects of the Hindus, and on their provincial superstitions, much light has yet to be cast. On the North of this Presidency, we have the *Vaishnavas*; in our immediate neighbourhood, the *Smartas*; and in the South, the *Shaivas* or *Lingavants*, in the practice of all their peculiarities. In the Dakshan, we have a general worship of deified heroes, as yet unnoticed, except in the most incidental manner. Many curious classes of mendicants, of whom little or nothing is known*, are to be found within the sphere of our peculiar observation. The religion of the Jainas, on which most valuable manuscripts, procured by Mr. WATHEN, are deposited in our library, is still, in many respects, to be unfolded. Our Transactions have only one paper, by Captain McMURDO, which refers to it. In the possession of the Jainas, there are many works calculated to throw much light on the religious history of India in general, with the use of which some of them would not be unwilling to favour a European student. I fondly trust and believe, that there are among our members, those who will continue to contribute, as circumstances may call them, to the exposition of the systems of faith, which have so long exercised their sway in this country, and the various literary works, which, though, unlike those of Greece and Rome, they are of little or no use in the cultivation of taste, are valuable as they illustrate the tendency of these systems in their connexion with social and public life, and as they explain a language the most copious in its vocables, and powerful in its grammatical forms, in which any records exist. Destitute of a knowledge of these systems, and the works in which they are embodied, the native character, and the state of native society, will never be sufficiently understood, a right key obtained to open the native mind, and all desirable facilities enjoyed for the introduction among the people of a body of rational and equitable law, and the propagation of the Gospel and the promotion of general education. There are some respectable patrons of the latter supremely important work, who overlook its importance; but their number is on the decrease.

As the touch'd needle pointeth toward the pole;
Thus unto thee inclines the holy soul:
It trembleth and is restless till it come
Unto thy bosom where it is at home."

No person who is familiar with the *Upanishads* can fail to mark the coincidence of the language of BAXTER in the preceding passage, with that of the Transcendentalists of India. This coincidence of language, however, does not warrant the inference that there is the least agreement of statement. In proof of this position, we have merely to quote the lines which follow those now given.

"Yet no such union dare the soul desire
As parts have with the whole, and sparks to fire;
But as dependent, low, subordinate,
Such as thy will of nothing did create.
As tendeth to the sun the smallest eye
Of silly vermin, or the poorest fly.
My own salvation when I make my end,
Full mutual love is all that I intend,
And in this closure though I happy be,
Its by intending, and admiring thee."

* Of one of these, the *Mánbhavas*, whom I had particularly in view in making this remark, I have just received an interesting account from Captain A. MACKINTOSH, the author of the *History of the Ramoshís*.

They ought to consider that the situation of those to be instructed, is to be attended to, as well as the instructions to be delivered. While divine truth must be propagated with unwavering fidelity, and all hopes of ultimate success rest on its own potency, its suitableness to the general character of man, and the assistance of divine grace, judgment ought to be employed in the mode of its application to those who vary much in their creeds, and differ much in their moral practice. We have the highest authority for an accommodation such as that for which I plead. Though the great truths proclaimed by the apostle PAUL were the same in all circumstances, they were introduced in very different ways to the Jewish Rabbis and people, and to the members of the Athenian Areopagus. I must hold, that there is no little unsuitableness in India, in addressing a Pantheist as a Polytheist, and *vice versa*: in speaking to a Jaina as to a Bráhmán; in condemning that at random which the natives may suppose to be unknown, and in using theological terms, and general phrases, without any very definite sense of their application by the natives themselves. The more a knowledge of Hinduism and of Hindu literature is possessed by any teacher, the more patiently and uninterruptedly will he be listened to by the people, and the more forcibly will he be enabled, and principally by contrast and concession, to set forth the authority, and the excellence, of the doctrines of Christianity.

In connexion with the subject to which I have now adverted, I may allude to the peculiar duty which devolves on us of collecting Sanskrita manuscripts. They are to be found in a purer state in the Dakshan than in any other part of India, and the poverty of the Bráhmans leads them readily to part with them. Those which were lately purchased by us are very valuable.

The contributions of the members of our Society to the elucidation of *Hindu Antiquities*, have done much to extend and support its credit. The proximity of the ancient excavations, which may be classed among the wonders of the world, could not fail to excite curiosity and inquiry. The descriptions and illustrations of those of *Gharipur* (Elephanta), *Sashti* (Salsette), *Karali* (Carlee), *Verula* (Ellora), *Bag* and *Ajanta**, though a few errors and oversights may be detected in them, are highly interesting. Mr. ERSKINE has satisfactorily shown the distinguishing characteristics of those of them which are respectively to be attributed to the Baud'dhas and Jainas, and the Bráhmans. It is to be hoped that the inscriptions which are to be found on some of them, and which are in the Sanskrita language, and in ancient characters very similar to those which have lately been published in the ably conducted *Journal of the Asiatic Society of Bengal*, will be soon understood. The Rev. Mr. STEVENSON has already been successful, to a great extent, in decyphering, and translating those of the temples of Karali, and thus leading to inferences by no means unimportant. Some of those of Kanadi, on Salsette, I should think, from a partial trial, present no greater difficulties than those which have been already overcome. The stone bearing the inscription of the temples at Elephanta, we learn from DIEGO de Couto the Portuguese Annalist, was sent to JOHN the Third of Portugal about the year 1534, and is probably now either in the Royal Museum of Lisbon, or in the University of Coimbra. The Royal Asiatic Society may, without difficulty, procure a transcript. There are excavated temples in the country, such as those of Nasik, and Junar, and others which have been erected, such as those of Abu, Palitana and Girnar, which have not yet been particularly described. What we principally require in reference to them all, is information as to the time at which, and the views with which, they were constructed; an estimate of them as works of art, or as indicative of the resources of those to whom they are to be ascribed; and an inquiry into the religious rites and services, for which they have been appropriated, and the moral impressions

* Written by Messrs. SALT, ERSKINE, COL. SYKES, &c.

which they seem fitted to make on those resorting to them. They are worthy of attention only as they may illustrate the civil and religious history, or practices, of the country. The grants of land, engraven on copper-plates, many of which are still to be found in different parts of the country, are next to them in importance in the advancement of antiquarian research. One of these was translated by Dr. TAYLOR. Mr. WATHEN has been successful in decyphering the most ancient of those in our museum; and the results, as stated by him in his communication in the *Journal of the Asiatic Society of Bengal* for August last, are both curious and useful. Ancient coins are occasionally found in different parts of the Presidency, and the Native States to the northward, which may aid in the correction, or enlargement, of such Genealogical Tables as have been lately published by Mr. PRINSEP of Calcutta*.

There is a small body of *Armenians* in Bombay, from which something interesting might be learnt. A dissertation by one of them on the antiquity of their native language, with notes by Mr. DICKINSON, has lately been transmitted by us to the Royal Asiatic Society, and cannot fail to be acceptable. There cannot be a doubt that the Armenians can fill up important blanks in our Church History, which, to the undue neglect of the orientals, is principally formed on the authority of the Roman and Byzantine Fathers.

The *Beni-Israel* of Bombay, and the adjoining territories, amount to about eight thousand. It is to be regretted that no considerable account of them has yet appeared, particularly as they have been long settled in the country, refuse the appellation of *Jew*, and are probably a portion of the Ten Tribes, never amalgamated, as the body of them probably was, with those of Judah and Benjamin.

The researches of our members on antiquities, and other subjects of observation and rational inquiry, have not been confined to India; but I cannot longer detain you by alluding either to their results, or by attempting to form, what is unnecessary, and what in me would be presumptuous, an estimate of the enterprize and intelligent observation and research of our MALCOLMS, ELPHINSTONES, POTTINGERS, RICHES and BURNES. The contiguity of our Presidency to Persia, Arabia, and Egypt; and the prospect of increased intercourse with these countries, by steam navigation, afford ground to hope that our geographical and historical knowledge of them will ere long be greatly enlarged. There is scarcely a country of Asia, which, even, in our present circumstances, does not furnish visitors to Bombay, who prove themselves ready to communicate to intelligent inquirers, information on places never as yet surveyed by any modern European traveller. Mr. WATHEN has been able, from conversing with Muhammadan pilgrims, to prepare a brief, but interesting, memoir of Chinese Tartary†.

I owe to the meeting an apology for the many imperfections of the sketch which I have rapidly taken. I have rather endeavoured to mark our progress, than to point out, what would perhaps have contributed more to our encouragement, the advantages and means of further advancement. Our Society, I may be permitted to hope, will soon again be inspired with its pristine zeal, at the same time that it is directed by its accumulated experience; maintain the character which it has earned for itself; and prove not unworthy of its incorporation with the Royal Asiatic Society of Great Britain and Ireland, an incorporation which must be admitted, notwithstanding some disadvantages, to be beneficial, as it secures that literary sympathy and communication which is greatly to be valued, and the circulation of our papers, with no expense to ourselves, and now in a convenient form, throughout the world.

* Such coins are occasionally worn as personal ornaments by natives, who have no idea of their value.

† See Asiatic Society's *Journal* for December, 1835.

XIV.—Miscellaneous.

- 1.—On the *Canis Vulpes montana*, or Hill Fox. By J. T. PEARSON,
Asst. Surg., Cur. Mus. As. Soc.

[Reprinted from the Bengal Sporting Magazine, Jan. 1836.]

Cl. <i>Mammalia</i> , Cuv.	Gen. <i>Canis</i> , Auctorum.
Ord. <i>Carnassiers</i> , Cuv.	Sub-gen. <i>Vulpes</i> , Auctorum
Fam. <i>Carnivora</i> , Cuv.	Sp. <i>Canis Vulpes montana</i> , mihi.

Rufous grey fox, with black throat, and tail white-tipped.

Description.—Size, length from tip of the nose to the insertion of the tail, 2 ft. 6 in.; length of tail, 1 ft. 7 in.; height at the shoulders, 1 ft. $1\frac{1}{2}$ in.

Colour.—general colour, rufous on the upper and fore parts of the body; becoming grisly behind, at the sides, and at the sides of the tail; behind the ears, rich velvety black, edged at the outer middle third with short velvety fur of a light fawn colour, and at the inner upper third, with light rufous; tip of the nose, as is usual in the genus, black and naked: upper lip white, with a few black bristles, and a narrow band of white extending along just above the margin, which is brown, to the corner of the mouth, where it widens and unites with a somewhat similar but fainter band from the angle of the lower jaw, from which junction the white proceeds along the side of the throat as far as the shoulder, forming a boundary between the black of the throat and the pale fawn colour of the side of the neck. A greyish black irregular spot, upon which the whiskers are set, is situated at the side of the muzzle from near the nose to the eye, and extending behind in the form of a line to the root of the ear, where it takes an abrupt course downwards, and is lost under the chin; middle of the nose and crown of the head, greyish rufous; inside the ears, side of the neck, and half the side behind the shoulder, (mid-way between the shoulder and hip) and the flank, light fawn colour, with a dark rufous band extending from between the ears to the middle of the back, where it becomes less distinct, and is continued along the upper side of the tail as far as the white tip. This longitudinal band is crossed by another over the shoulders, forming a well defined cross; shoulders, outer sides of the hind legs, and sides of the tail, dark grisly grey, partaking at the edges of rufous; outer, and back part of the paws, tan, with toes of mingled rufous and black; throat, chest, fore part of the belly and inner side of the thighs, dusky black, having a few white hairs, interspersed under the throat, a white triangular spot on the chest, an approach to a rufous tint on the belly, and being bounded by a white line in front of the thighs and hind legs. The remaining under surface, hinder part of the fore-legs, and under side of the root of the tail, is of a light fawn, approaching in some parts to an Isabella colour. Tail, dark rufous, waved with black above, grisly grey at the sides, fawn colour, gradually becoming waved, with black, underneath, and furnished for about the length of three inches with a white tip.

The general ground colour of the fur is a dingy back, or dirty white, according to the shade of the part. It is long, thick, soft, and very warm, mixed with a few strong hairs; it varies in length from an inch to one inch and half upon the neck, sides, and back. Upon the muzzle, shoulder, and outer side of the thighs, under the chin, and on the limbs, it lies close, and is short; while behind the ears, it is very short, and has the gloss and softness of velvet. The tail is exceedingly bushy, some of the fur being full two inches in length, and at the tip, more than three.

The hill fox appears to approach the marking of the *C. Decussatus* (cross fox) in the dark colour of a portion of the under parts, and in the cross over the back and shoulders; but the cross is not black in this species, as it is described in that. It is of a bright rufous colour in this,

and is rendered particularly distinct by the light fawn colour at the sides of the neck and behind the shoulders. The perpendicular stroke of the cross is $2\frac{1}{2}$ inches wide upon the back of the neck, and two inches immediately behind the shoulders, while further back, it is wider, but indistinct. The cross band is two inches and a half wide, and very distinct, until lost on the shoulders in the mixture of rufous and grisly grey of that part.

The hill fox is a very handsome animal. Its colours are, for the most part, bright, and often well defined at their edges, offering a strong contrast with those adjoining, or, as upon the neck and anterior part of the thighs, separated from one another by a narrow distinct line of white.

It seems to be intermediate between the *Vulpes vulgaris* (common fox) and the cross fox, which, indeed, may, after all, be probably varieties of the same species.

As nothing is known of the habits and manners of this animal, it would be conferring a boon upon zoological science, if any person, well acquainted with the subject, would describe them. It is said to be a native of the lower range of the Himálayan mountains.

2.—On the Soil suitable for Cotton, Tobacco, Sugar, and the Tea plant.
By H. PIDDINGTON.

[Read at the meeting of the Agricultural Society, March 1836.]

I preface what I have to say to the Society on the soils placed on the table with a few remarks, which I trust may be thought worth placing on record. My object in doing so is again to impress upon members of what vital importance it is to the advancement of the agricultural interests of the country, and to the safety and success of every agricultural speculation, to procure samples of all soils from other countries in which valuable products grow.

The same climate and soil are, we know, in a greater or less degree the essential requisites for obtaining the production of one country in another; and for our present purpose we may perhaps say that plants *find* their food in the soil, and are enabled to *digest* it by the climate. They *do* digest, we know, and this in the strictest sense of the word.

The popular ideas of climates are vague enough, but it may be roundly asserted, that scarcely one who uses the word knows what is really meant by soil; or rather what is really meant by "the same soil." This arises from our vague notion of the thing itself. The very words used to distinguish soils express, more frequently than any thing else, their appearance, and some of their physical qualities; scarcely any their essential—that is their chemical properties. We talk of light and heavy, of sandy and clayey, moist and dry soils, which are all physical properties, and two clayey or two sandy soils may be actually as different as light and darkness from each other! The words ferruginous and calcareous are, it is true, chemical terms, but such vague ones that they designate whole *classes* of soils, of which each sort is widely different from its neighbours. The tea soils and the Arracan tobacco soils on the table are both ferruginous soils, but differing as widely as soils can do; for the iron in the one is a carbonate of iron, and in the other the red oxide of iron.

COTTON—Nothing then but a sample of the soil and a correct analysis of it can assure the speculator, that while he is trying to rear any given foreign product, he is not (misled by loose names) absolutely blundering in darkness, and attempting an impossibility. I begin with Cotton as a most prominent example, though my proofs on the subject are not quite so full as I could wish; and I shall surprise the Society not a little when I say, that all the expensive efforts which have been made hitherto to obtain good cotton have probably failed from this one cause, *that we have been at work on the wrong soil!* How far, with the American cottons, differences of climate may also have operated is not here the place to examine,

but vegetable productions do, to a great extent, acclimate themselves ; while it is probable that nothing can compensate to them the want of a principal constituent of the soil. Now I have not been able to obtain specimens of the American cotton soils, but I have good authority for stating that the soil of the Sea Islands is wholly a calcareous sand—in other words a light chalky or shelly soil ; so that it may probably contain from 50 to 60 per cent. of calcareous matter (lime generally in the state of chalk), and we have been attempting to grow this cotton on a soil which barely contains a trace of it ! The soil of the Botanic Garden, for instance, not containing more than $1\frac{1}{2}$ or 2 per cent. : Indeed we may say generally, that till we reach the *kunkur* districts, none of the soils of lower Bengal, out of the reach of the inundations, contain any great portion of lime. I showed some years ago*, that the inundations deposit lime, and that much of the fertilising effect they produce is due to it.

The American cotton is, then, on account of differences of climate, a case not strictly in point, but the Bourbon cotton—grown both at Bourbon and the Mauritius—which sells for a shilling, when the Sea Island sells for 13*d.* and the Manilla cotton, which sells for 11*d.* when the Bourbon is worth a shilling, are both cottons of hot climates like our own ; and both these are grown in highly calcareous soils. The soil on the table before you is from the Mauritius ; it is sent me by M. GENEVE, of La Riviere Noire, one of the finest estates on the island, as an excellent cotton soil, and contains 32 per cent. of carbonate of lime, (or in plain English, one-third chalk ;) there is, moreover, phosphate and perhaps not less than 40 per cent. of calcareous matter ! Its iron too is in a peculiar state, that of protoxide or the black oxide of iron ; and in this respect, it probably resembles the black cotton soils of Southern India. No wonder that the Bourbon cotton, though it grows well in many of our gardens near town, where it meets with plenty of calcareous matter amongst the lime-rubbish with which most of them are filled, is said to degenerate when cultivated in the open fields, which do not contain 2 per cent. of lime. I know, from the experience of several years, that it does *not* degenerate if it is duly supplied with calcareous matter ; but that it will produce most abundantly, and for years, cotton worth from 10*d.* to 11*d.* per lb. in a proper soil. If the soil does not suit it, it will produce little else than leaves and wood, and the staple will deteriorate. Samples of American cotton soils are wanting now to make our theory on this head perfect ; but I would advise no man to attempt foreign cottons in a soil containing less than 15 per cent. of lime, and its iron mostly in the state of protoxide or black oxide.

TOBACCO.—Tobacco soils are the next, and here we are more fortunate, for there are on the table soils from Arracan (Sandoway) ; a soil from Singour in Burdwan, near Chandernagore, the tobacco of which, though of the same species as that of the surrounding country, sells at the price of the Arracan sort ! and the soil of the best Bengal tobacco, which is grown at and about Hinglee, in the Kishnagar district, near factories formerly held by me. Col. HAZETA and Dr. CASANOVA are our authorities for saying, that the tobacco soils of the Havanna are *red* soils, and those of Manilla, I know, are also *red* soil. Now the red and reddish brown soils contain most of their iron in the state of peroxide, or the reddish brown oxide of iron ; while the light-grey soils contain it only in the state of protoxide, or the black oxide of iron. I believe the quality of the tobacco to depend mainly on the state and quantity of the iron in the soil ; while it is indifferent about the lime, which we have seen is so essential to cotton. None of these tobacco soils contain any lime. Their analysis shows them to contain :—

* Trans. of the Phys. Class, As. Soc. Vol. I.

	<i>Aracan soil.</i>	<i>Singour soil.</i>	<i>Hinglee soil.</i>
Oxide of iron (peroxide).....	15.65	10.60	6.00*
Water and saline matter.....	1.00	0.75	1.50
Vegetable matter and fibres.....	3.75	1.10	.75
Silex.....	76.90	80.65	87.25
Alumina.....	2.00	4.50	1.50
	<hr/>	<hr/>	<hr/>
	99.40	97.69	97.00
Water and Loss.....	.60	2.40	3.00
	<hr/>	<hr/>	<hr/>
	100.0	100.00	100.0
	<hr/>	<hr/>	<hr/>

—from which it will be seen that the best tobacco soil we have hitherto found in India contains 16 per cent., or nearly one-sixth, of iron, which is mostly in the state of peroxide, and that the inferior sort of tobacco grows in a soil containing only 6 per cent., one-sixteenth of iron of which is moreover mostly in the state of protoxide or black oxide.

I thought it worth examining what the quantity of iron in the different sorts of tobacco would be ; and I found that, while the ashes of one ounce, or 480 grains, of Havanna and Sandoway cheroots gave exactly 1.91 grains or 0. 40 per cent. of peroxide of iron, the ashes of the same quantity of the Hinglee or best Bengal tobacco only gave 1.50 grains or 0.32 per cent., and it appears to exist in the first two in the state of peroxide. and in the last, as a protoxide, of iron ; rendering it highly probable that the flavour of the tobacco to the smoker depends on the state and quantity of the iron it contains ! for we have now, observe, traced the iron from the soil into the cheroot. Green copperas water, which is a solution of sulphate of iron, is often used by the American and English tobaccoists and planters to colour and flavour their tobacco ; and this would be decomposed by the potass of the tobacco, and sulphate of potass and carbonate of iron be formed. Carbonate of iron is of an ochre yellow colour. I took care to ascertain that this process had not been performed with the cheroots used for my experiment ; and I do not believe our Bengal cheroot-makers know of this method.

SUGAR.—Sugar seems to depend both on the state of the iron and on lime in the soil. The sugar soil before you is also from the Black River, (Mr. GENEVE's,) an estate upon which from 3000 to 7000, and even on one spot the astonishing quantity of 12,000 lbs. of sugar have been obtained from an acre, of from 12 to 150 bazar maunds per bigah ! Captain SLEEMAN is my authority for these statements.

Now the peculiarity of this soil is, you will observe, that it is a *red* soil, i. e. that its iron is mostly in the state of peroxide ; and it contains more-over about 9 per cent. of carbonate of lime, with probably some sulphate and phosphate of lime, say perhaps altogether 10 or 12 per cent. of calcareous matter. We have in many instances endeavoured to cultivate this cane on soils destitute both of peroxide of iron and lime, and we complain that the cane has been found watery. It is clear that the cultivator who would succeed in sugar should pay attention to these peculiarities ; for without doing so he may have *returns*, but often no profits. His profits, in a word, may depend upon his canes, his cotton, or his tobacco, being *fed* with the food which they require. I used the words *feed* and *digest* because it cannot be too often repeated that plants are living beings, and that the vigour of their life depends, as with ourselves, on abundant and suitable food.

TEA SOILS.—The tea soils, though I notice them last, are not the least interesting. The first is a soil from Assam, for which I am indebted to Captain JENKINS ; and the second is from the Bohea Hills in China, sent

* Mostly protoxide.

round by Mr. GORDON, the Secretary to the Tea Committee, and obligingly given to me by Mr. GRANT, of the Honourable Company's Export Warehouse. How very alike they seem, you will at once have noticed, and their analysis gives as follows:—

Tea soils of Assam. Tea soil of China.

	Surface soil.	At 2½ feet deep.	
Water.....	2.45	2.00	3.00
Vegetable matter.....	1.00	.80	1.00
Carbonate of Iron.....	7.40	6.70	9.90
Alumina.....	3.50	5.45	9.10
Silex.....	85.40	84.10	76.00
	<hr/>	<hr/>	<hr/>
	99.75	99.05	99.00
Traces of phosphate and sulphate } of lime and loss, .....	.25	.95	1.00
	<hr/>	<hr/>	<hr/>
	100.0	100.00	10.000

There are two peculiarities in these soils; the first, that they contain no carbonate of lime, and only traces of phosphate and sulphate; and the next, that their iron is almost wholly in the state of carbonate of iron—a widely different compound from the simple oxides. They would be called poor yellow loams; and cotton, tobacco, or sugar-cane would probably starve upon them: but we find that they suit the tea plant perfectly. It is a striking coincidence, that we should find our tea soils and those of China so exactly alike.

I fear to grow prolix, though I have much more to say on the subject of soils; I shall therefore break off, trusting that for the present I have amply shown the necessity of a careful examination of the soil; and that the commercial public, who can do so much for us in this way, will not neglect their own interests in procuring specimens of soils for us; for to go to work in ignorance of this great element of success, is absolutely to blunder on in the dark where chemistry would lend us an unfailing light.

[We have also received specimens of the tea soils for analysis, but for want of space must postpone the notice of our results, which agree for the most part with Mr. PIDDINGTON'S. We have also an analysis of the Assam tea soil by Dr. McCLELLAND.—ED.]

3.—Action of Copper on Ink.

A curious case lately came under my notice of the effect of saline moisture and copper united on writing ink. The Bengal Bank referred to my examination three bank notes sent in by a native, who protested he knew not how the numbers and signatures had disappeared; that he had left them in a small copper box on his departure into the country, having precisely noted the amounts and numbers—and that on his return they were thus altered. The Secretary of the Bank disbelieved the marvellous statement, because the endorsements remained untouched.

I conceived it would be very easy, at first sight, to restore the writing by the usual method of slightly acidifying the paper, and then testing with prussiate of potash, which if the smallest traces of the iron remained, would develop the letters in blue. The only effect however of the application of this re-agent was to develop a copious red-brown upon the entire surface of the paper, proving how strongly it had been impregnated with a solution of copper:—in one of the three papers there was a general faint blue where the signature might be expected, but not the faintest trace of a number or letter could be recovered. It immediately occurred to me, that a solution of copper would in fact dissolve away the iron while it deposited the copper, and thus leave none of the former metal to be acted upon by the prussiate. To prove this point beyond a doubt, I select-

ed paper containing black writing that had stood for many years uninjured and placing it between two clean copper plates, allowed a current of acidulated water to pass through. In a minute or two the whole writing disappeared, and could not be restored by the prussiate; although where the colour of the ink was merely discharged by acid, the usual effect was manifest. The native ink being carbonaceous remained uninjured throughout; and where even a slight proportion of this ingredient was mixed with the English ink, the removal was so far prevented. This circumstance presents a ready mode of obviating such accidents for the future, for the present is not, it appears, the first occasion of the kind. A poor native pilgrim took some notes to Jagannáth in a small copper roll kept on his person for safety. After the customary period of bathing in the sea, he returned, and found his notes effaced, nor would the bank at that time make them good to the unfortunate holder.

The preventive alluded to is simply to mix Bengálí or Indian ink, half and half, with the English metallic ink. I have long been in the habit of doing so for the labels of mineral cabinets, where it is known that pyrites and other substances frequently obliterate the traces of common writing ink.

J. P. Sec.

4.—*Suspension Bridge at Fribourg in Switzerland.*

[Having alluded in the last number to this surprising work on the authority of private descriptions just received from relatives in Switzerland, we imagine our Engineer friends in this country (so many of whom we are proud to reckon among our readers) will be curious to hear more of it. We therefore hasten to extract the following account from JAMESON'S *Edin. Phil. Journal**.—ED.]

The town of Fribourg is built on the left bank of the Sarine. Both sides of this small stream are very steep; and rise to the height of about 220† feet above its bed; and travellers coming from Berne to Fribourg were formerly obliged to descend the hill, in order to reach a small wooden bridge which crosses the river, and immediately after by a steep ascent of about 200 feet to reach the top of the opposite bank before coming to the centre of the town. The passage through Fribourg thus occupied nearly an hour; but the case is changed since the erection of the new suspension bridge.

These difficulties and delays were long considered the unavoidable consequence of the local situation of the town, until some bold spirits conceived the idea of uniting, by means of a suspension bridge, the steep banks of the Sarine. It was necessary that the bridge should pass over a great part of the town itself, and the scheme was considered completely utopian; yet certain of success, the authorities and some active citizens determined to submit the measure to the consideration of engineers of different districts. Various designs were accordingly offered, and the government of the canton gave the preference to that of M. CHALLEY, of Lyons, whose plan has since been executed under his immediate superintendence.

The gateways at either end of the bridge are of Doric architecture, and are about 65 feet in height. The tops of their arches are about 42 feet above the roadway, and the arches have a span of 20 feet. The masonry of the gate is 46

* We take this opportunity of correcting a few errors in our observations on the Roof of St. PETER'S Church in the Fort.

1. The central vault had not opened in the vertex from *end to end*, but only a little towards the east end. We remembered having seen it apparently cracked, but this was merely from the knocking away of the Gothic moulding to examine its state—Its firm condition should have been an additional argument against condemning it.

2. The present groined roof of the nave has *not* a flat roof above it, this is confined to the side aisles.

3. We understand that the additional expence to Government has been only about one-third. We alluded however only to the *roof*, in supposing that the cost had been "doubled or tripled."—ED.

† All the measurements have been reduced from French to English agreeable to the ratios given in the *Annuaire du Bureau des Longitudes*.

feet in width, and its thickness is about 20 feet; although the largest blocks of the hard limestone of Jura were employed in this work, iron cramps were used to complete the union of the stones, and above 24 tons of iron were used for this purpose.

The width of the valley of the Sarine at the point where the bridge is built, or, in other words, the distance between the inner face-work of the two gateways on either bank of the river, and consequently the span of the suspended roadway, is 871 feet. It may be easily conceived that a good deal of doubt was entertained as to the propriety of trusting to a span of so great an extent, and the idea of suspending the bridge at the middle at first occurred to M. CHALLEY as the best mode of forming the communication. On weighing the difficulty, however, of obtaining a solid foundation for a pier 220 feet in height in the bottom of an alluvial valley, he soon relinquished this idea; and the bridge has therefore been constructed with a single span of 871 feet.

The roadway is suspended in the manner now universally known, by four cables of iron wire* passing over the upper part of the gateways. Each cable consists of 1200 wires, each about $\frac{1}{8}$ inch in diameter, and 1140 feet in length. To avoid the difficulty of moving these heavy cables, each wire was brought separately to its place, and they were united on the spot by the workmen, who were suspended during the work. We are happy to add, that no accident of any kind occurred during this operation. It is calculated that the four united cables are capable of sustaining a weight equal to 2946 tons.

The four cables are fixed in chain-pits or shafts cut out of the solid rock on either side of the river. In each of these pits four cables pass through a vertical cylindric chimney or pillar, which bears three heavy domes resting upon it, and at the same time abutting against grooves cut with much care in the rock to receive the springing stones. At the bottom of the pillars the cables are made fast to blocks of very hard stone, which are cubes of $6\frac{1}{2}$ feet. The cables, therefore, cannot slide without lifting the whole of these enormous buildings, strengthened as they are by their connexion with the solid rock.

M. CHALLEY began this work in the spring of 1832. He brought out of France, we think, only a foreman who had assisted him on former occasions, and engaging in this arduous enterprise with the inexperienced workmen of the country† who had never seen a suspension bridge, he completed the work in spite of all these difficulties; and on the 15th October 1834, fifteen pieces of artillery drawn by forty-two horses, and surrounded by 300 persons, crossed the bridge through; they united in one body as well on the middle as at the ends of the roadway. Nor was the least appearance of derangement of the structure discovered on the closest examination. Some days after the whole inhabitants of Fribourg and its suburbs passed over in procession, so that there were no fewer than 1800 persons on the bridge at the same time; and all classes of travellers, mercantile and curious, have since united with the natives of the Swiss cantons in testifying their entire satisfaction with the bridge. Although the severe proof to which constructor of this work subjected it, by loading the roadway with about 20 lbs. on each square foot, did not take place till the month of October 1835, yet it may safely be said that the colossal bridge of Fribourg was completely finished in two years and a half. The whole expense was only about £24,000.

The only bridge which can be compared for its dimensions with that of M. CHALLEY is the Menai or Bangor bridge, which joins the Isle of Anglesea to the main land of England. The largest vessels sail below it with full canvass set. It was constructed by the celebrated Engineer TELFORD; but the Menai bridge is only 550 feet in length, while the bridge of Fribourg is 871 feet. The roadway of Mr. TELFORD's bridge is about 106 feet above the level of high water, and M. CHALLEY'S 167 feet above the level of the river Sarine.

* It is not perhaps generally known that in all the suspension bridges in France ropes formed of wires are employed, instead of the solid links used in England.

† This remark reminds us of the Ségur bridge built by Col. Presgrave under difficulties so much superior.—See vol. II. p. 538.—Ed.

Meteorological Register, kept at the Assay Office, Calcutta, for the Month of May, 1836.

Day of the Month.	Observations at 10 A. M.										Observations at 4 P. M.										Register Thermometer Extremes.		Wind.		Weather.	
	New Stand.	Barometer red. to 32°.	Old Stand.	Barometer red. to 32°.	Wet Baro. meter at 32°.	Difference.	Thermome-ter in air.	Wet bulb.	Thermom.	Leslie's Dif.	Dew point.	Hair Hygrometer.	Cold on roof.	Heat in sun on roof.	Rain.	Morning.	10 A. M.	4 P. M.	Morning.	10 A. M.	4 P. M.	Morning.	10 A. M.	4 P. M.		
1	29.717	751	29.751	573	30.614	1.33	96.5	79.8	17.6	9	70	76.1	100.4	100.6		sw.	sw.	s.	sw.	sw.	s.	cumuli.	clear.			
2	29.732	752	29.766	574	30.616	1.33	97.1	80.2	16.9	9	69	74.5	109.6	109.6		sw.	sw.	s.	sw.	sw.	s.	do	do			
3	29.670	753	29.704	575	30.618	1.33	97.1	80.2	16.9	9	56	72.3	117.1	117.1		sw.	sw.	s.	sw.	sw.	s.	do	do			
4	29.633	754	29.667	576	30.620	1.33	97.1	80.2	16.9	9	70	75.4	112.0	112.0		sw.	sw.	s.	sw.	sw.	s.	cumuli.	do			
5	29.591	755	29.625	577	30.622	1.33	97.1	80.2	16.9	9	84	77.6	103.5	103.5		sw.	sw.	s.	sw.	sw.	s.	do	do			
6	29.553	756	29.587	578	30.624	1.33	97.1	80.2	16.9	9	80	78.6	103.5	103.5		sw.	sw.	s.	sw.	sw.	s.	do	do			
7	29.515	757	29.549	579	30.626	1.33	97.1	80.2	16.9	9	83	77.9	120.7	120.7		sw.	sw.	s.	sw.	sw.	s.	do	do			
8	29.477	758	29.511	580	30.628	1.33	97.1	80.2	16.9	9	71.5	77.9	104.2	104.2		sw.	sw.	s.	sw.	sw.	s.	do	do			
9	29.439	759	29.473	581	30.630	1.33	97.1	80.2	16.9	9	78.7	78.7	132.5	132.5		sw.	sw.	s.	sw.	sw.	s.	do	do			
10	29.401	760	29.435	582	30.632	1.33	97.1	80.2	16.9	9	77.5	77.5	119.2	119.2		sw.	sw.	s.	sw.	sw.	s.	do	do			
11	29.363	761	29.397	583	30.634	1.33	97.1	80.2	16.9	9	69.5	75.9	123.8	123.8		sw.	sw.	s.	sw.	sw.	s.	cumuli.	do			
12	29.325	762	29.359	584	30.636	1.33	97.1	80.2	16.9	9	70.0	75.9	119.0	119.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
13	29.287	763	29.321	585	30.638	1.33	97.1	80.2	16.9	9	74.0	77.2	102.0	102.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
14	29.249	764	29.283	586	30.640	1.33	97.1	80.2	16.9	9	78.5	78.5	106.5	106.5		sw.	sw.	s.	sw.	sw.	s.	do	do			
15	29.211	765	29.245	587	30.642	1.33	97.1	80.2	16.9	9	70.0	80.8	96.8	96.8		sw.	sw.	s.	sw.	sw.	s.	do	do			
16	29.173	766	29.207	588	30.644	1.33	97.1	80.2	16.9	9	76.0	81.7	99.5	99.5		sw.	sw.	s.	sw.	sw.	s.	do	do			
17	29.135	767	29.169	589	30.646	1.33	97.1	80.2	16.9	9	at	80.5	104.0	104.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
18	29.097	768	29.131	590	30.648	1.33	97.1	80.2	16.9	9	at	80.5	104.0	104.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
19	29.059	769	29.093	591	30.650	1.33	97.1	80.2	16.9	9	71.5	76.7	110.2	110.2		sw.	sw.	s.	sw.	sw.	s.	cumuli.	do			
20	29.021	770	29.055	592	30.652	1.33	97.1	80.2	16.9	9	70.4	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
21	28.983	771	28.983	593	30.654	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
22	28.945	772	28.945	594	30.656	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
23	28.907	773	28.907	595	30.658	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
24	28.869	774	28.869	596	30.660	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
25	28.831	775	28.831	597	30.662	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
26	28.793	776	28.793	598	30.664	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
27	28.755	777	28.755	599	30.666	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
28	28.717	778	28.717	600	30.668	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
29	28.679	779	28.679	601	30.670	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
30	28.641	780	28.641	602	30.672	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
31	28.603	781	28.603	603	30.674	1.33	97.1	80.2	16.9	9	71.5	70.4	109.0	109.0		sw.	sw.	s.	sw.	sw.	s.	do	do			
Mean.	29.619	751.5	29.653	576.5	30.656	1.33	96.5	79.8	17.6	9	74	76	110.9	110.9	1.90	Monsoon regular.										

The new standard Barometer has stood this month, at 10 A. M. .036 and at 4 P. M. .049 lower than my former standard, exactly as last month, shewing that the difference of readings at the two hours is not attributable to any fault in the compensation column of the former barometer, but that it is really due to the greater sensibility of the new instrument.

The wet barometer has this month been used to ascertain the aqueous tension of sulphuric acid, up to the 21st of sp. gr. 1.83 into which it is evident that water gradually insinuated itself (see column of tensions)—and after that date of sp. gr. 1.134, which yielded an average tension of 42, that of pure water being 106.

The dew point was ascertained on the Dalton plan, with a lump of ice to cool a thin glass of water.

